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April 21st.

Dr. Bridges in the Chair.

Fifteen members present.

Mr. Redfield called the attention of the meeting to the following Memoranda attached to specimens of Schizæa pusilla, in the Herbarium of N. Y. Lyceum of Nat. Hist.

"First discovered by Dr. C. W. Eddy, near Quaker Bridge, in the pine barrens of New Jersey, about 30 miles from Philadelphia. Dr. E. was in company with J. LeConte, Pursh and C. Whitlow, and though he and Mr. LeConte found all the specimens, Pursh has claimed the honor of the discovery himself."

Signed, Torrey and Cooper.
1868.

Above is in handwriting of Dr. Torrey.

"First found in 1805; not found again till detected by me in company with Dr. Torrey, in June, 1818."

Signed, Cooper.

April 27th.

The President, Dr. Hays, in the Chair.

Twenty-three members present.

The issue of the sixth number of the Proceedings for 1868 was announced.

The following gentlemen were elected members:

Isaac S. Fogg, John C. Sinclair, Rev. J. L. Withrow and Henry Bower.

The following were elected correspondents:

Albany Hancock, of New-Castle-upon-Tyne, England; and Brevet-Major F. Curtis, M. D.

On favorable report of the Committees the following papers were ordered to be published:

On the CETACEANS of the Western Coast of North America.

BY C. M. SCAMMON, UNITED STATES MARINE.

Edited by Edward D. Cope.

Introductory note by the Editor.

The present article, by Capt. Scammon, is the result of many years' observation in an almost unexplored and with difficulty explorable department of zoology. It was submitted by the author to the Smithsonian Institution, with the request that it might be rendered beneficial to science. The Secretary, Prof. Henry, referred it to the editor; with a request to publish such parts as should be deemed valuable to zoology, and to add such elucidation and explanation as would contribute to the same end.

In the carrying out of these views of the Secretary of the Smithsonian Institution, a general classification has been made, and a systematic record of the species and genera mentioned in the essay has been prefixed A few species have been inserted from other sources, and the opportunity improved to give descriptions of some species from the Atlantic coasts.

The scientific student will await with interest the receipt by our national institution of further materials, so that the structure and affinities of these remarkable beings may be fully made known.

PART I.

SYSTEMATIC SYNOPSIS

Of the species of the Cetaceans of the West Coast of North America. By Prof. E. D. COPE, *Corresponding Secretary of the Academy of Natural Sciences of Philadelphia.*

CETACEA.

Two sub-orders of this order are known to exist at the present period, which differ as follows:

MYSTICETI.

Mandibular rami distinct from each other, without symphysis. Teeth none in either jaw. A series of transverse corneous laminæ on each side of the roof of the mouth.

DENTICETI.

Mandibular rami united distally by a symphysis. Teeth present in one or both jaws. No corneous laminæ in the mouth.

I. MYSTICETE.

There is but one family of this group, characterized as follows:

Spiracles two. Front of cranium plane, much raised above the orbital processes; no transverse or longitudinal crest on the cranium............. *Balænidæ.*

I. BALÆNIDÆ.

Of this family numerous genera and species have been discovered and described. It embraces the most gigantic of vertebrated animals, and some of the most useful. They inhabit all oceans, but are rarer in the equatorial regions, abounding most in the frigid and temperate seas. Their pursuit gives occupation to many men of all nations.

Owing to their vast bulk and the want of appreciation on the part of those who are engaged in their capture, their study has been one of great difficulty. It is only within a few years that a sufficiently extended amount of material has been accumulated to enable the genera and species to be properly discriminated. The works of Gray, Eschricht, Reinhardt, Lilljeborg, Van Beneden, Flower and the writer, contain the most recent results of these investigations.

The genera are as follows:

I. Cervical vertebræ coössified; fingers five.
No dorsal fin or gular folds; coracoid rudimental.
Ribs single headed.. *Balæna.*
First rib double headed.. *Hunterius.*

II. Cervical vertebræ free; fingers four.
A. The throat without plicæ; no dorsal fin; ribs ? single headed.
No acromion.. *Rhachianectes.*
An acromion.. *Agaphelus.*
B. Throat and breast plicate; a dorsal hump or fin.
a. The vertebral canal not closed by the processes of the cervical vertebræ; ribs single headed.
No acromion.. *Megaptera.*
A well developed acromion.. *Eschrichtius.*
aa. The canalis vertebralis enclosed by diapophyses and parapophyses of cervical vertebræ; both acromion and coracoid.

Anterior ribs single headed.................. ....*Balænoptera.*
Anterior ribs double headed................ .... *Sibbaldius.*

Those engaged in the pursuit of whales recognize these natural groups without difficulty, as evidenced by their vernacular names of long standing. Thus the species of div. I are "right whales," of II A, "scrag whales;" of II B α, "humpback whales;" and the Balænopteras, etc., "finner whales." The last are most numerously represented by species.

BALÆNA Linn.

Two species of this genus have been described by authors as inhabiting the North Pacific Ocean, though the materials upon which their identification has been based is of the most slender description. I am as yet unable to determine to which of them the right whale mentioned by Capt. Scammon should be referred. I therefore enumerate both here. A third species, the Bow Head of American whalers, is stated to pass south of Behring's Straits at certain seasons of the year, according to Capt. Scammon. I enumerate it as the same as the Greenland Right Whale of English authors, which is the "bow-head" of the Eastern American whalers, in contradistinction to the Right whale, (B. cisarctica).

BALÆNA MYSTICETUS Linn.

Bow-head. Catal. Whales and Seals, Brit. Mus. p. 81.

BALÆNA SIEBOLDII Gray.

Cat. B. M. 96, *Balæna australis* Temm. Faun. Japon. t. 28, 29, (from Japanese model).

BALÆNA CULLAMACH Chamisso.

Nova Acta, Acad. Curs. xii, 251 Tab. (from Aleutian model). Cope, Pr. A. N. Sci. Phil. 1868, 225.

RHACHIANECTES Cope.

This genus is now first characterized. Its only known species I originally united with Agaphelus Cope, but the form of the scapula is so different that it must be distinguished. While that of Agaphelus is identical with that of Balænoptera, it is in the present genus quite like that of Balæna.

RHACHIANECTES GLAUCUS Cope.

Agaphelus glaucus Cope, Proceed. Academy Nat. Sciences, Philada. 1868, p. 225. The California Gray Whale.

This species was originally described from specimens by Wm. H. Dall, of San Francisco.

MEGAPTERA Gray.

In this genus the rudiment of a dorsal fin exists as a hump on the posterior part of the dorsal region. The fins are longer than in any other genus, and two or more of the cervical vertebræ are occasionally more or less coössified. The following species are known more or less imperfectly: M. longimana Rudolphi, from the Arctic Seas; M. osphyia Cope, from the Western Atlantic; M. brasiliensis Gray, (*Balænoptera* Gray), from the coast of Brazil; M. lalandii Fischer, from the Cape of Good Hope; M. kuzira Gray, from the Western Pacific. The full measurements and description of Capt. Scammon enable me to add another species, viz.:

MEGAPTERA VERSABILIS Cope.

Spec. nov. The North Pacific hump-back.

This species possesses pectoral fins, apparently intermediate in length between those of the M. longimana and the species with shorter fins, as M.

osphyia and M. kuzira. They are between one-third and one-fourth the length; in the two last mentioned, between one-fourth and one-fifth. It has 26 pectoral and gular folds. Siebold states that the M. kuzira possesses but ten. In this animal the warts extend to the top of the front, a character not ascribed to any Atlantic Megaptera. It differs also from M. longimana, and resembles M. lalandii and M. kuzira, in having the pectoral black on the external face; in the Greenland species and in the model of the Aleutian Islanders, described by Chamisso, it is white. The characteristic color of the belly, in the most typical form, is said to be entirely black. In this respect it differs from all other Megapteræ, which present more or less white or grey, on the inferior surfaces at least.

BALÆNOPTERA Lacep.

Many species of this genus inhabit the immense area of the ocean. They are regarded as pertaining to two genera by Gray. Thus the known species fall into two groups, viz.: I, those in which the dorsal fin is at the commencement of the third fourth of the length from the head; and II, those where this fin measures only the second third. To the first belong certainly only B. rostrata and B. velifera; to the second B. physalus, B. duguidi and B. sibbaldii Gray (*Cuvierius* Gray), all Atlantic. There is not enough known of the following species to determine their characters in this respect: B. arctica Schlegel, N. West Pacific; B. swinhoei Gray, China Seas; B. patachonica Gray, S. W. Atlantic; B. antarctica Gray, New Zealand Sea. The following species have been named: B. fasciata (Physalus Gr.), B. australis Desmoul. The species of the North West coast of North America is sufficiently described and figured by Capt. Scammon to furnish means of comparison with most these species. It differs from these, and may be called

BALÆNOPTERA VELIFERA Cope.

The Finner Whale of the Oregon coasts.

This species differs from all that have been described in that respect, in the color of the baleen; from the B. arctica of the Japanese Seas, the coloration of the body separates it; in the latter the sides are spotted black and white, in the present shaded from the brown of the upper to the white of the lower surfaces. The large size of the dorsal fin and its anterior position are marked characters; the northern species, with larger fin, is still more different from the B. arctica, the only one with which it would be probably identical.

The more southern form, with very small fin, may be another species—possibly a Sibbaldius. The B. velifera cannot unfortunately be compared with the B. swinhoei and B. patachonica, as no similar parts are figured or described.

The baleen, says Capt. Scammon, is of a light lead color, streaked with black, and its surface is marked with transverse roughening. In the B. physalus the whalebone is, according to Gray, slate-colored on the inner side, white streaked; on the outer side nearly black and with still darker streaks. In the B. rostrata it is nearly all white, with some black at the base.

SIBBALDIUS Gray.

Species of this genus have been discovered in arctic, antarctic and tropical seas. S. borealis (*Flowerius* Lilljeborg), the most gigantic of the finners, occurs in the northern Atlantic and Polar Seas, but appears to be rather rare. S. laticeps, a much smaller species, has, so far as known, a high arctic range, while S. tuberosus, sp. nov., has been found on the eastern North American coast. S. schlegelii is known to occur on the coast of Java. A doubtful species has been named S. antarcticus. The species may be divided into three groups, thus: I, the dorsal fin of ordinary form, two-thirds

EXPLANATION OF THE CUTS AND OF THE LITHOGRAPH.

Fig. 1. Beluga rhinodon Cope cranium, from above; from Upernavik.

Fig. 1a. Beluga rhinodon teeth.

Fig. 2. Beluga declivis Cope scapula.

Fig. 3. Beluga angustata Cope scapula.

Fig. 4. Balæna cullamach Chamisso; from north west coast; proportions approximate. (Capt. Scammon does not represent the recurved rictus figured by Chamisso.

Fig. 5. Megaptera versabilis Cope; from California coast; drawn to a scale of ·25 inch to a foot. This and all the remaining cuts reduced to two-thirds of the proportions given.

Fig. 6. Megaptera versabilis, from below.

Fig. 7. Rhachianectes glaucus; from the Californian coast; scale ·25 inch to a foot.

Fig. 8. Rhachianectes glaucus Cope, from below.

Fig. 9. Balænoptera velifera Cope, approximate proportions; from coast of California.

Fig. 10. Balænoptera velifera, approximate proportions; from Queen Charlotte Sound, February, 1865.

Fig. 11. Sibbaldius sulfureus Cope, approximate proportions; from California coast.

Fig. 12. Globiocephalus scammonii Cope; coast of California; about ·5 inch to the foot.

Fig. 13. Same, from below.

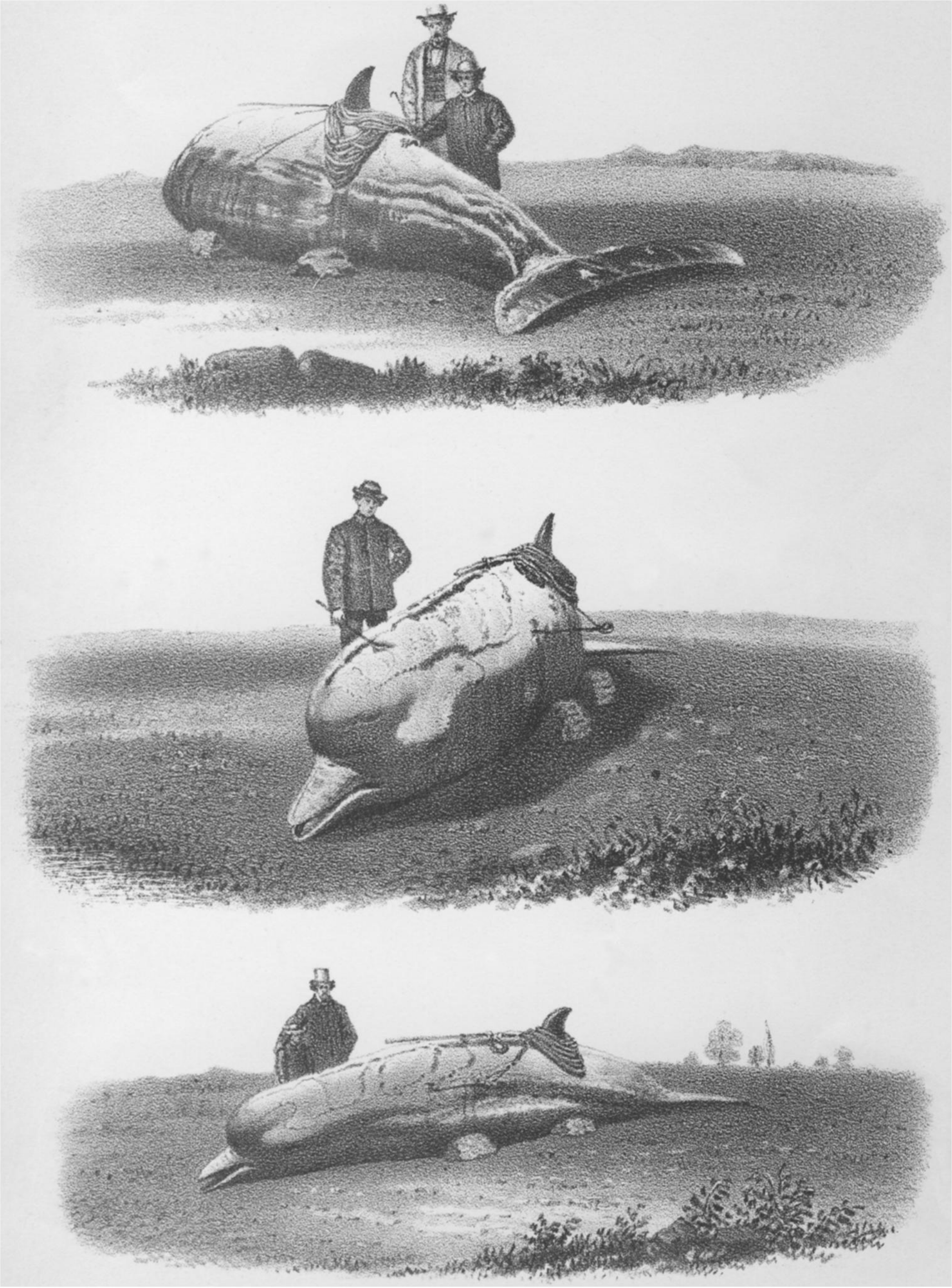
Fig. 14. "Bottle-nose Grampus;" California coast; scale near ·5 inch to the foot.

Fig. 15. Orca rectipinna Cope, male; approximate proportions; California coast.

Fig. 16. Orca rectipinna Cope, female; same scale and locality.

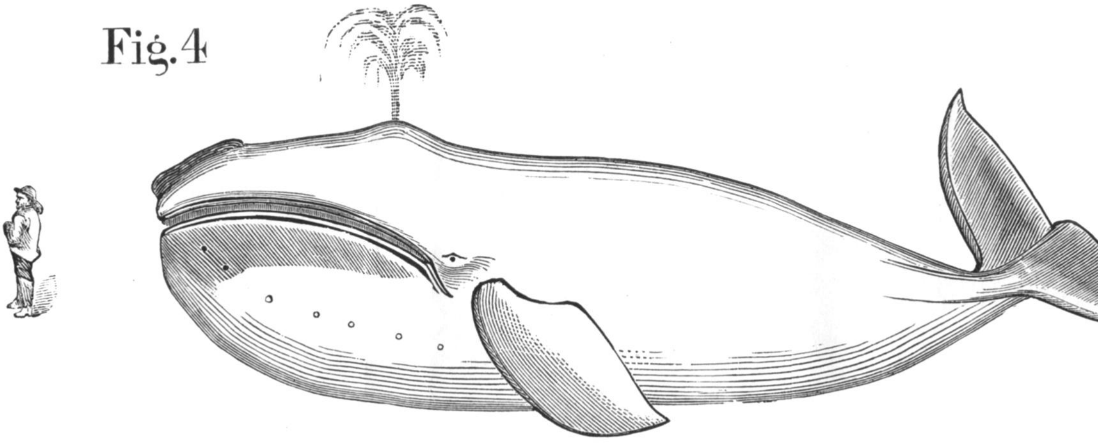
Fig. 17. Orca ater Cope; Juan de Fuca Straits, 1868.

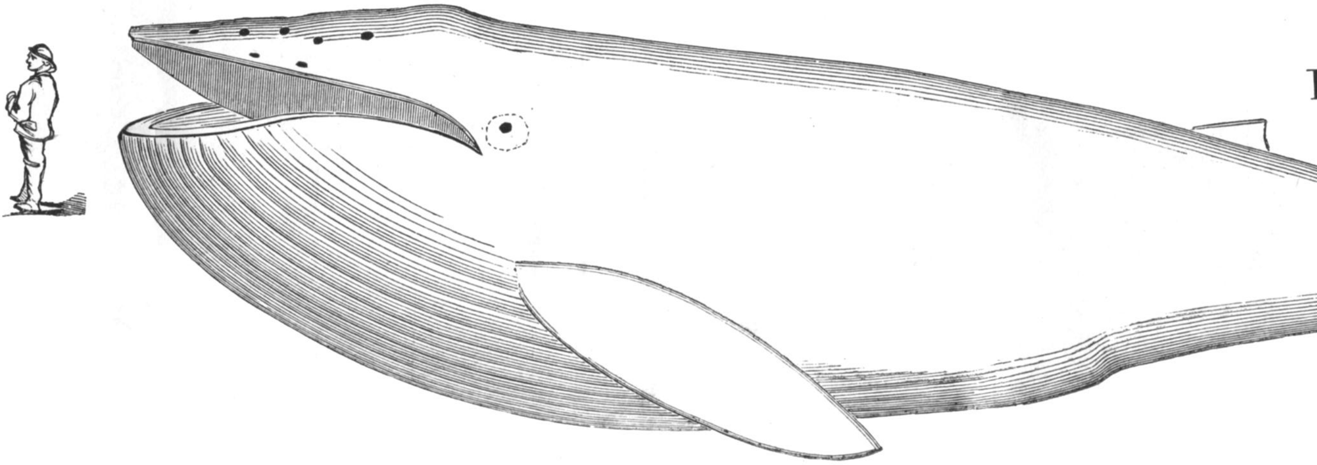
Plate I. Hyperaodon from the shore of Narragansett Bay, near Tiverton, Rhode Island; from photographs obtained by Samuel Powell, formerly Secretary of the Academy, at Newport, Rhode Island.

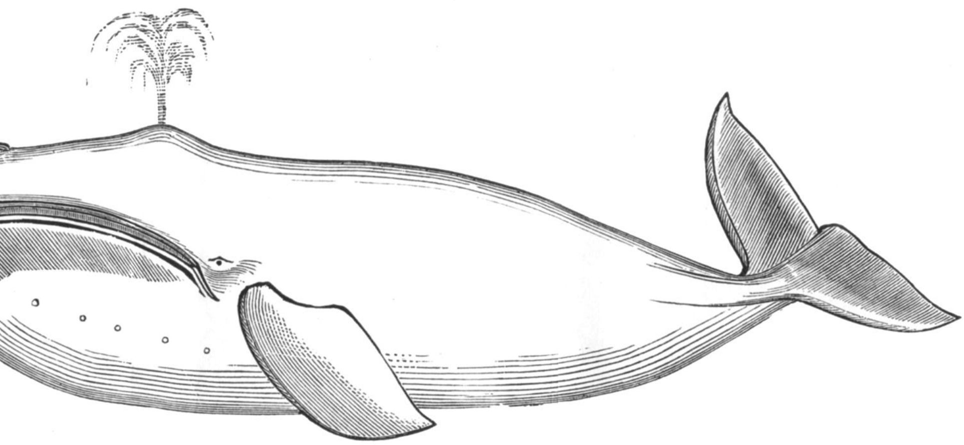


Hyperaodon of Narragansett.

Fig.4







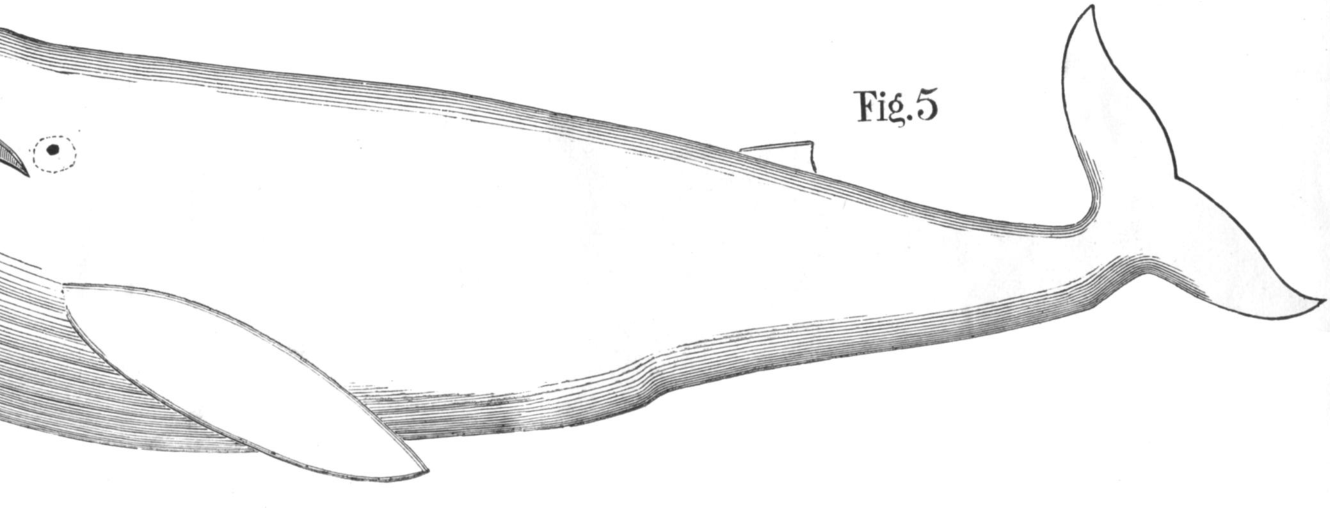


Fig.5

Fig.6

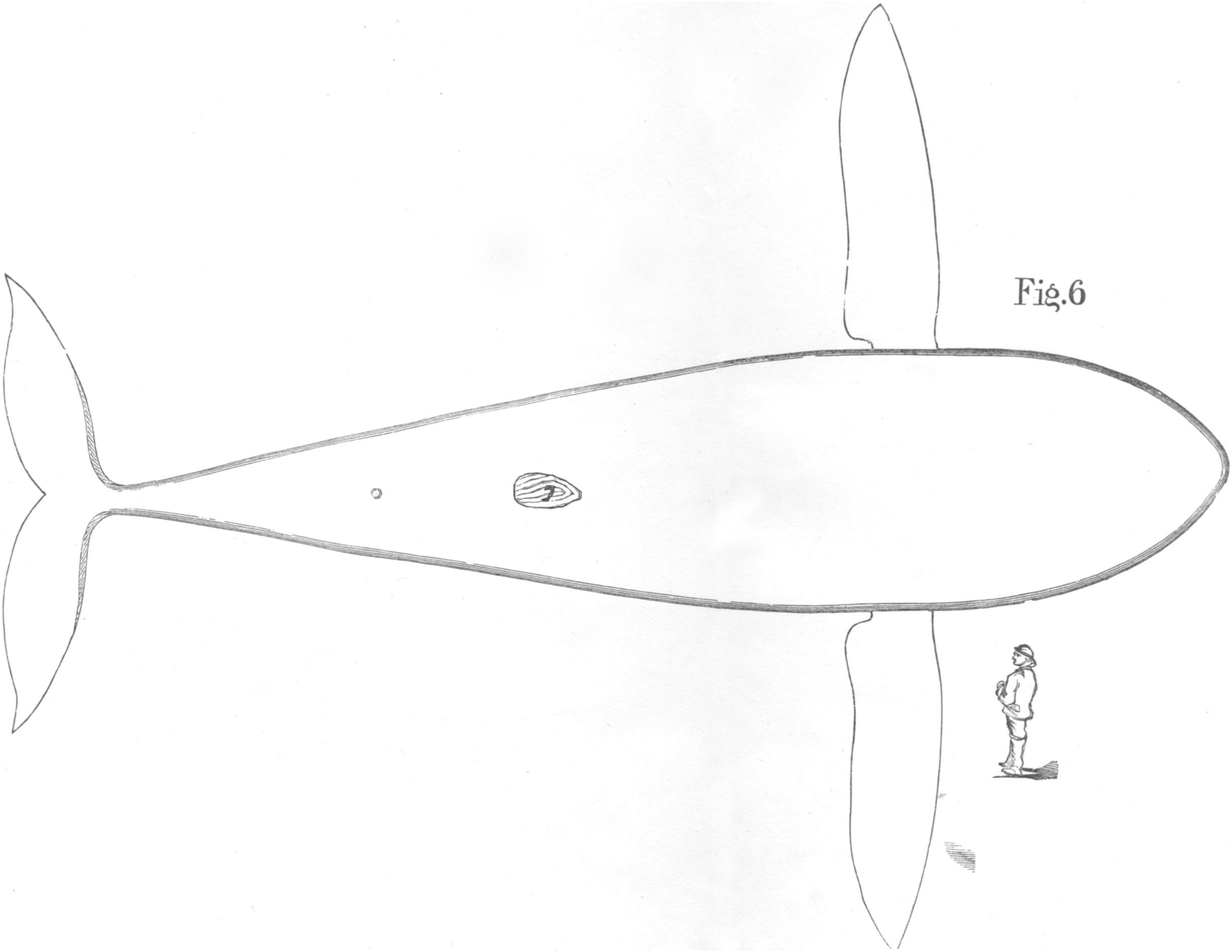


Fig.7

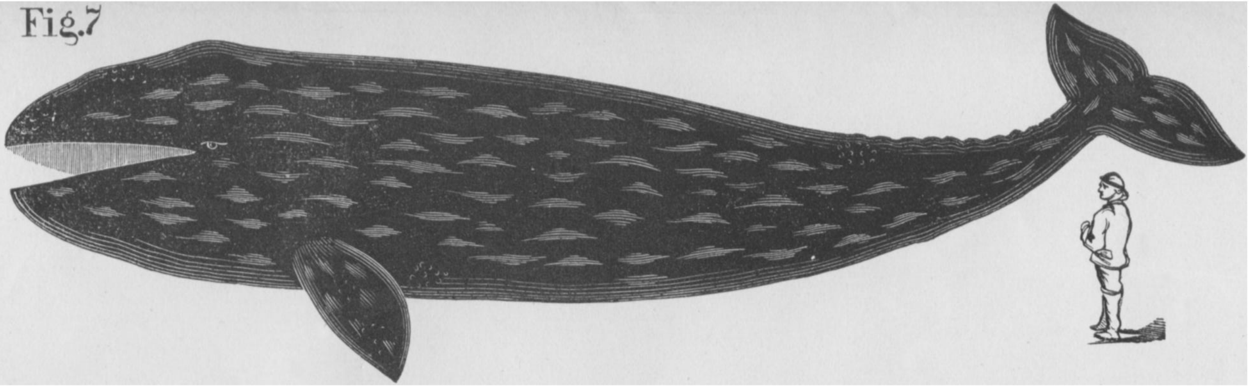


Fig.8

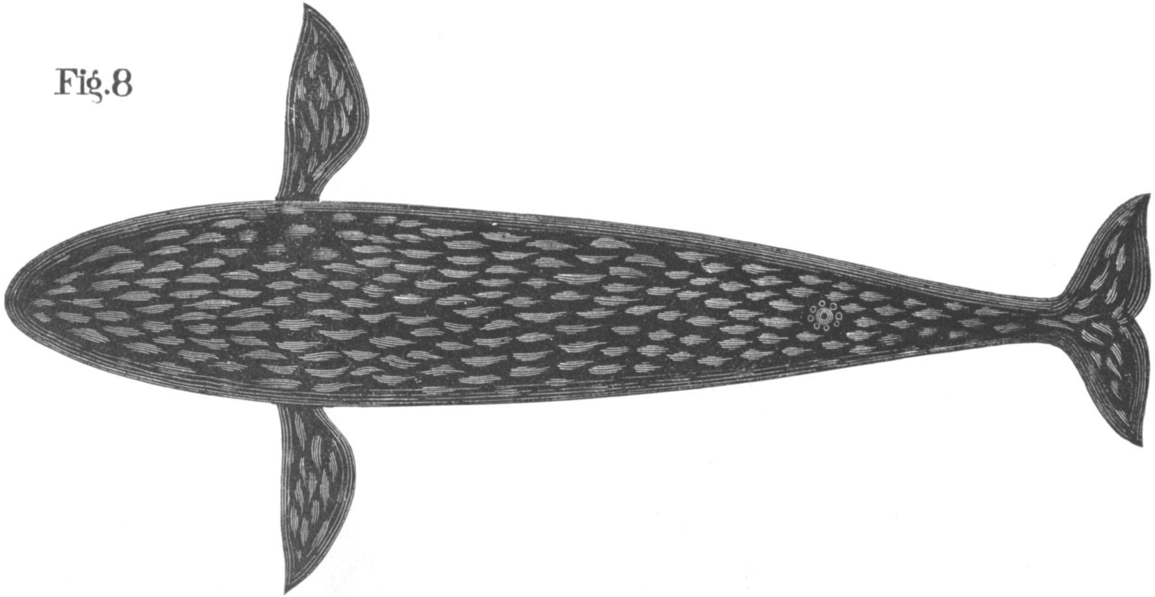
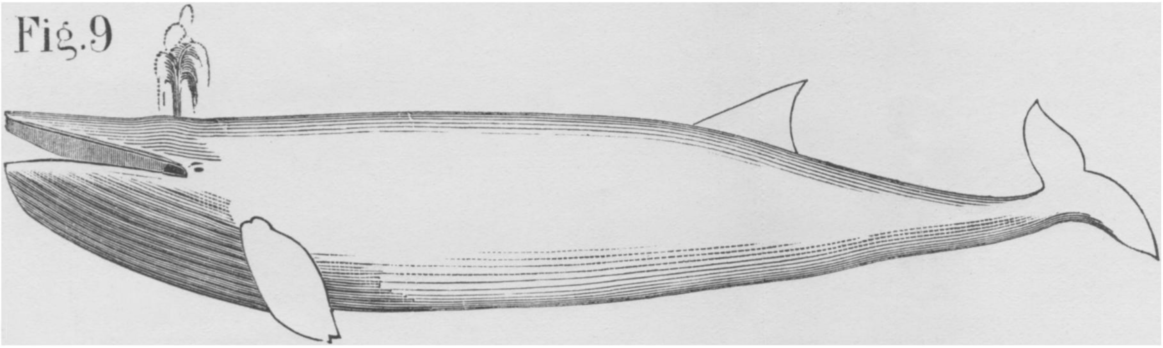


Fig. 9



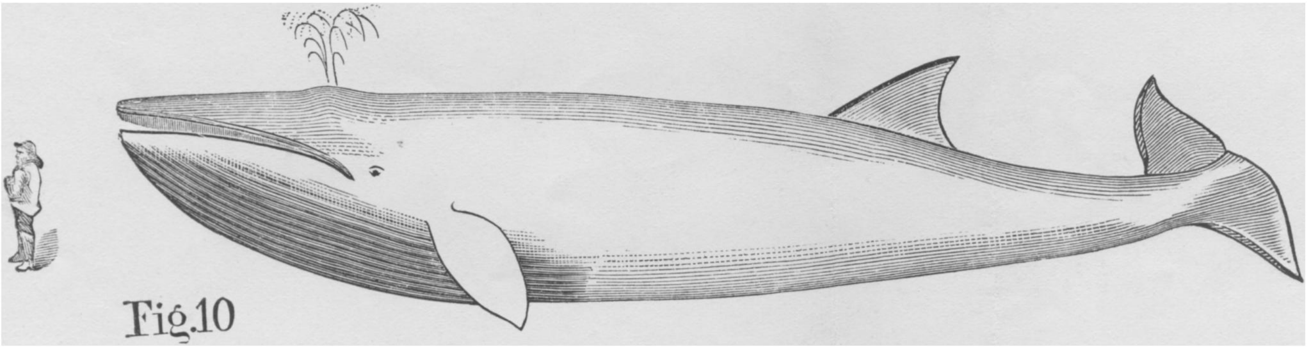


Fig. 10

Fig. 11

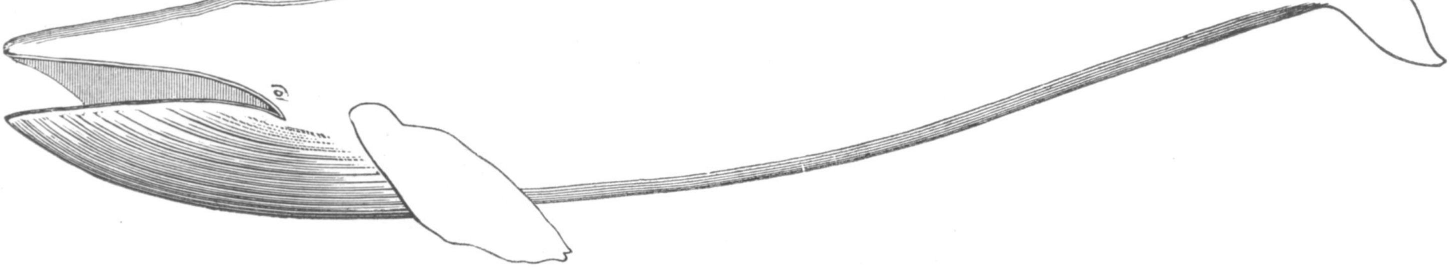


Fig.12

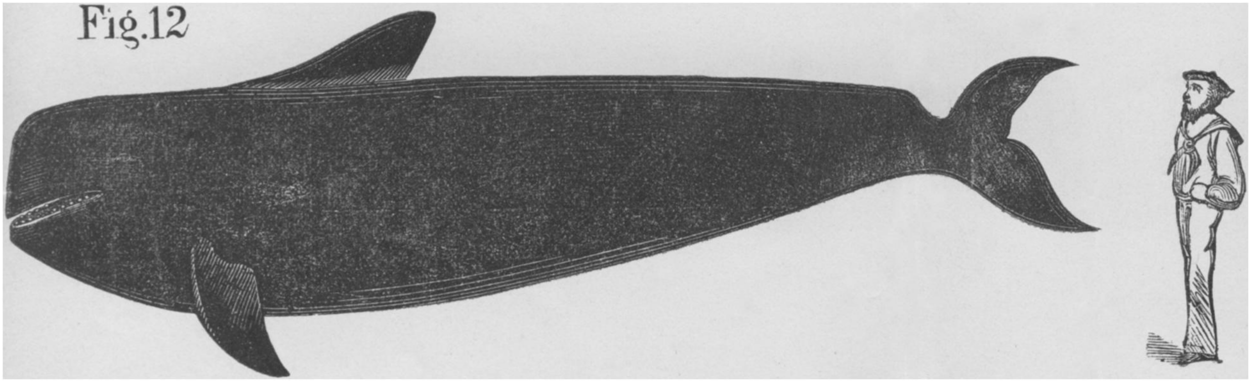


Fig.13

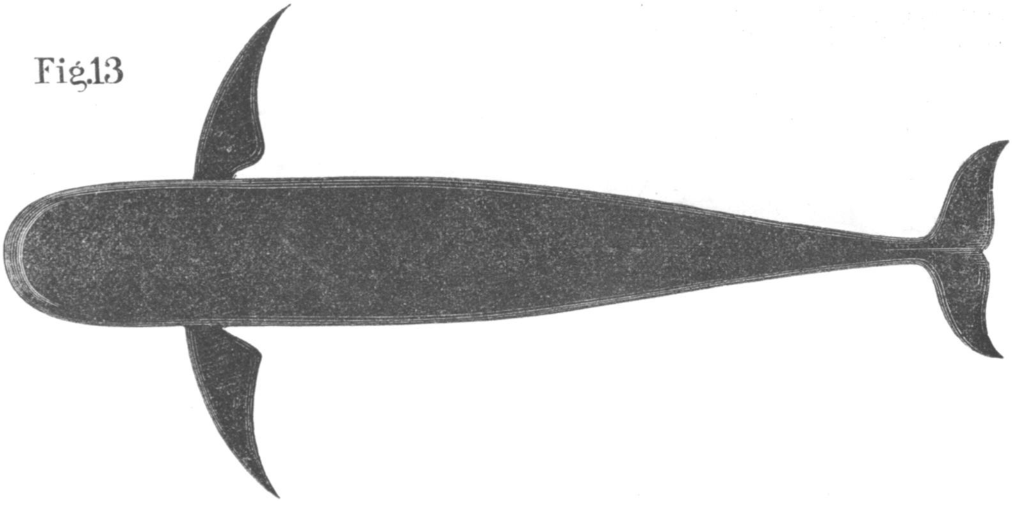


Fig.14

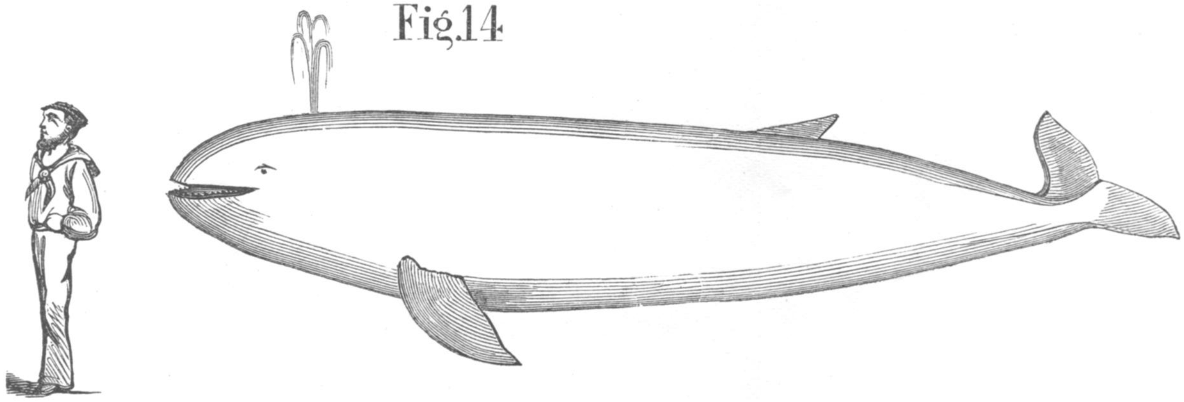


Fig.15

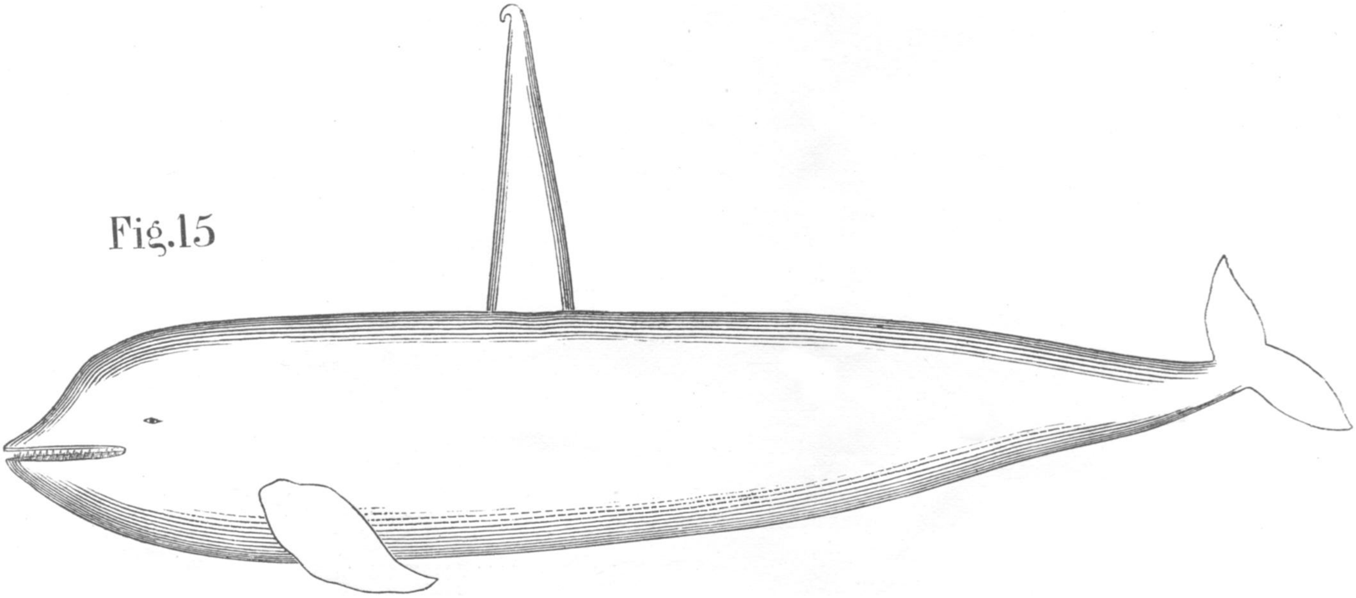


Fig.16

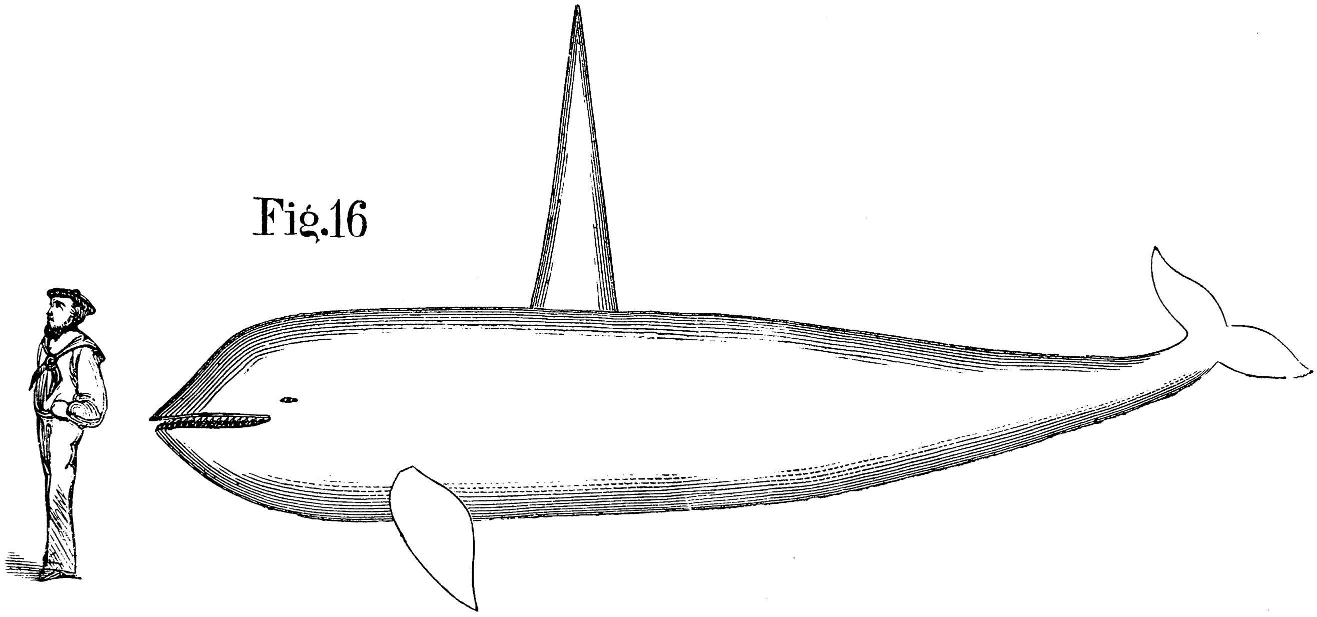
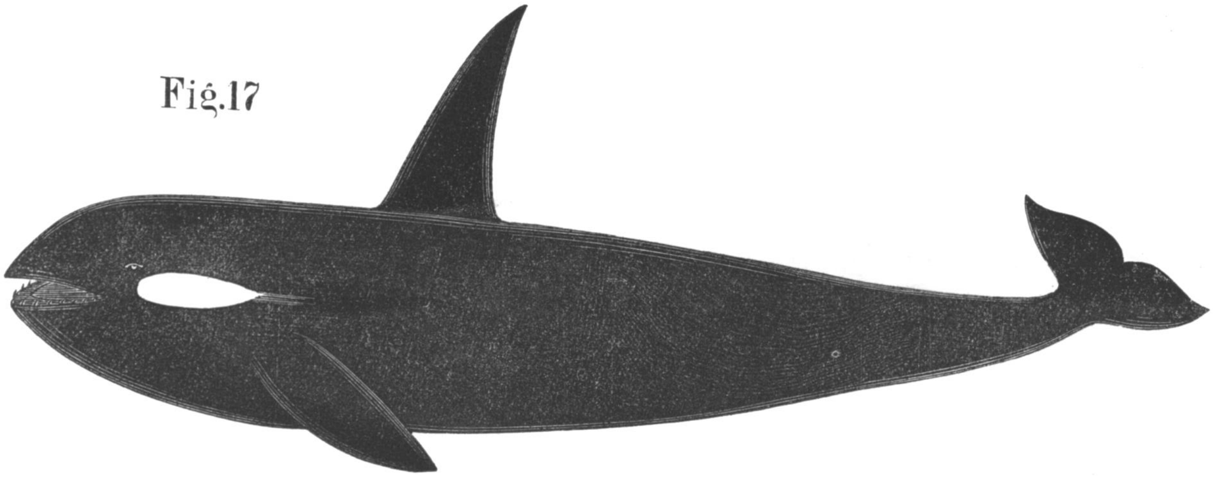


Fig.17



the length from the muzzle; dorsal line behind it smooth. S. tectirostris Cope, S. laticeps Gray. II, the dorsal a small conical mass, situated well posteriorly; the dorsal line with several humps behind it; several cervicals with complete cervical canal; S. tuberosus Cope. III, the dorsal fin a small conic mass situated three-fourths the length from the muzzle, the dorsal line smooth behind it; the axis only, with complete cervical canal; (*Flowerius* Lillj.) S. borealis Fisch.

The S. TUBEROSUS m. differs from the S. laticeps as above, and probably in its five or six humps above the caudal portion of its vertebral column. The latter peculiarity is not mentioned in authors' descriptions of S. laticeps, and though its existence is not denied, it is probably wanting. I have heretofore considered this whale as the latter species, and described it as such.—Proceed. Acad. Nat. Sci. Phila. 1866, 297.

The finner whale, above mentioned as SIBBALDIUS TECTIROSTRIS Cope, is established on a nearly complete specimen of a young ♀ in the Museum of the Academy. Its length when fresh, in a nearly straight line from the end of the muzzle to the emargination of the flukes, is between 47 and 48 feet. This depends on independent observations of several persons. The skeleton as preserved lacks a number of caudal vertebræ* and a few dorsals. Restoring those that are at present wanting, from the obvious extent of interruption, and the last caudals, according to Flower's estimates for the S. laticeps, we have the following total length:

	No.	Length.		Restored.	
		ft.	in.	ft.	in.
Cervicals	7	2	6	0	0
Dorsals	11	28	10	2	0
Lumbosacrals	16			0	0
Caudals—diapophyses perforate	4			0	0
" —diapophyses imperforate	10			1	0
" —no diapophyses	1		3	0	6
Cranium		10	0		
		41	7	3	6
Restored		3	6		
Total		45	7		

The individual is in the young stage, since not only are all the epiphyses of the vertebræ separated, but those of the humerus also. According to Flower, the coössification of the epiphysis of the humerus takes place when the animal has developed somewhat beyond one-half the adult dimensions. This animal may therefore be considered as being at least half grown, which renders a length of 70—80 feet probable for the adult. The present specimen was a female, according to those who had seen it in the flesh, and who described to me the mammæ and the vulva. In its larger dimensions it thus exceeds the B. laticeps, and especially the B. tuberosus, as the latter is adult at about the size of this young specimen.

The atlas has not yet reached the Museum. The axis presents below no surface adapted to a *tuberculum atlantis*. The median portion of the anterior face of the centrum presents a low conic projection, the *processus odontoideus*. The di- and parapophyses are united distally, embracing a large ring, whose outside longitudinal diameter is two-thirds the transverse diameter of the centrum of the same. The neural arch presents no spine, but a pair of lateral prominences like rudimental zygapophyses. The parapophyses of the remaining cervicals are long, except on the seventh, where they are almost wanting. The diapophyses are long in all, longest and decurved on the seventh, where it stands above the parapophysis of the sixth. They are nearly united with the parapophysis on the third cervical, and are no doubt fully so in mature age. The fourth cervical is lost, but it is scarcely probable that it presented a complete ring for the transmissal of the vertebral artery, etc. There are no rings attached to the vertebræ from the fifth inclusive. The centra are all transversely oval.

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* All are in possession of the Academy, but those alluded to are yet in a compost heap and unfit to handle.

	Inches.
Height centrum and arch of axis	12·25
" centrum	7·1
Transverse extent of axis	25·
" " centrum of do	11·5
" " neural canal	5·75
" " of third cervical	23·
" " centrum do	11·
Length parapophysis sixth cervical	5·
Vertical diameter centrum (? 5th) dorsal	7·
Length centrum do	6·
Vertical diameter centrum second caudal, with perforate diapophyses	10·5
Length centrum do	10·5
Height spine and arch middle lumbosacral	14·5
" from floor canal to top anterior zygapophysis do	6·

There is no neural spine on the second, third and fourth cervicals, and it is rudimental and small on each of the remainder. Those of the dorsals and lumbars are not particularly elevated.

The humerus is very short and thick, and the hand remarkably small.

The scapula, as in other Sibbaldii, has considerable antero-posterior extent, and well developed acromion and coracoid. The disk is divided into three areas on the inside, by two slight ridges.

Dimensions.

	Inches.
Antero-posterior width	33·
Vertical "	21·
Length acromion	7·5
" coracoid	4·5
Diameter of glenoid cavity	8·

The muzzle is elongate, and with a narrow acumination. The supraorbital plates of the frontal are

Each nasal is as wide as long medially; anteriorly concave above, the line of junction of the two in one plane, forming a median ridge, which is prolonged into a prominent median point. The otic bullæ are slightly compressed and carinate below, and their surface is not markedly rugose. The malars are in shape something like first ribs; that is, with an enlarged head, with prominences imitating capitulum and tubercle, a short narrowed shaft, and expanded distal extremity. The distal third is occupied by an ovate ? articular surface, thinning out the margin on one side. The shaft is thin and concave, both longitudinally and transversely, on one side.

The inner margin of the palatine bones is regularly continuous with the short pterygoids, which are very short, and do not approach near the otic bullæ; Rudolphi represents the latter as prolonged to beyond the extremity of the bulla. The posterior plate of the vomer in S. tectirostris extends much further posteriorly than Rudolphi represents for the S. laticeps, and though there is no doubt some variation in this respect in the same species, the difference is here very considerable. In S. laticeps it extends to a little behind the anterior margin of the bulla; in S. tectirostris to behind the posterior margin, concealing much of the basioccipital.

The mandibular ramus is strongly curved, and very convex externally, less so internally. The vascular foramina are very large externally, and very much reduced in size on the inner face. The coronoid process is strongly elevated, curved outwards, and acuminate. There is a distinct angular process below the condyle.

Measurements.

	Ft.	In.
Length of cranium (axial)	10	6·
Greatest width of occipitals	3	7·
Width at supraorbital plate	4	4·
" of each maxillary at middle		9·75
" of supraorbitals above orbit		13·
" (least) of frontal region		13·5
" of nasals		4·3
" intermaxillaries at middle		5·3
Length nasal		6·
" malar		
" maxillary above	7	6·
" ramus mandibuli (in curve)	10	
" " " to coronoid		19·
Depth " " at condyle		8·5
" " " at coronoid		13·
" " " at middle		9·
Length otic bulla		5·2

The baleen is short, and of a dark lead color, the inner and shorter margin white for varying widths. The bristles are fine for the size of the animal, and not nearly so coarse as in Megaptera osphyia or Rhachianectes glaucus.

	In.
Length of longest plates with gum	15
Width at base	10
No. plates in four inches	10
Whole number plates on one side, 126 preserved—add about 24 lost from extremity	150

Most of the ribs are yet in process of cleaning, and will be introduced into the final monography and illustration of the North American Cetacea in course of preparation. That which by its deeply bifurcate head indicates the generic affinities of the species, is in form much like the first of S. laticeps. It measures in

	Ft.	In.
Total length	3	
Distal width		7·25

The anterior head is the narrower, and its line of junction with the posterior extends to near the middle of the length of the same.

The animal's color above was a uniform black ; the exterior face of the flippers and stripes along the gular plicæ were also black. The belly was white, separated, according to my informant, from the black abruptly, forming a "water line." The posterior face of the flippers white for the distal half. The under side of the caudal fluke white also. These points I derived from Joshua Carey, who stripped the carcass.

The dorsal fin was not seen by me, but was described by a number of parties, whose statements agreed. It was of the usual form and elevation common among finner whales, compressed, with a long base, and eighteen inches in height; the dorsal line behind it clean and smooth.

The species appears to be most nearly allied to the S. laticeps of Gray, of the Arctic Seas. It differs distinctly in the following points: 1. The nasal bones of the latter are longer, more parallelogrammic, and not strongly keeled and mucronate. 2. The coronoid process of the mandible is less elevated. 3d. The cervical vertebræ, including the axis, are furnished with well developed spinous processes. 4. The mandibular ramus is more compressed. 5. The vomer is more, and (6) the pterygoids are less prolonged posteriorly.

The difference from the S. tuberosus is found in the form of the dorsal fin and character of the dorsal line; it is marked, and of a kind which Lilljeborg has regarded as generic in the case of S. gigas (S. borealis), but which appears to me to be specific in this case. This species is distinctly smaller than the S. tectirostris, and presents a *tuberculum atlantis* articulating with the *epistrophæus* below, which is not indicated by the latter in S. tectirostris.

In many respects the species appear to be quite similar. The deposit of the specimen of S. tuberosus in the Museum of the Academy having been delayed, the nearer comparison must be made when it arrives, which will be in a short time, it is anticipated.

As compared with the S. gigas there is a marked difference in the form of the nasal bones, if Dubar is to be relied on; he represents them as even more elongate than in the S. laticeps. The first rib of this animal is apparently much wider. The annulate cervicals are less numerous. The dorsal fin has a different form and position.

The type of the S. tectirostris came ashore during the winter of the present year, on the coast near Sinepuxent Bay, on the Maryland peninsula. It had been dead some time; the stomach contained but little, and that a mixture of finely divided scaly and stringy material, not readily recognizable. Bottles dropped at numerous points off the coast of Maryland and Virginia by the Coast Survey, were always carried ashore in the course of a few days or weeks, to the south-west of the point where dropped. It is therefore probable that this whale is a native of the ocean from which it drifted, and that it is one of the "fin-backs" of the Western Atlantic.

The species described by Capt. Scammon, if of this genus, belongs to the sub-group of the S. borealis, so far as the proportions and position of the dorsal fin are concerned; the cervical vertebræ are not yet known. Its size would also distinguish it from the species of the other groups, as well as from the S. schlegelii Flower, from the Malaysian Seas.

SIBBALDIUS SULFUREUS Cope.

The Sulphur-Bottom of the North West Coast.

This immense whale is as yet too insufficiently known to be distinguished as fully as desirable, but the marked peculiarity of coloration separates it from the only species with which a comparison is necessary—the S. borealis or gigas of the North Atlantic. Capt. Scammon describes it to be a gray or brown above, paler than in the Balænoptera velifera, and beneath, a sulphur yellow. Length from seventy to ninety feet. The colors of the S. borealis are described as polished black above, milky white beneath, by Dubar.

DENTICETE.

Three families of this order are known, which differ as follows, according to Flower:

Costal cartilages not ossified. The hinder ribs losing their tubercle and retaining their capitular articulation with the vertebræ. The greater number of the cervical vertebræ ancylosed together. Pterygoid bones thick, produced backwards, meeting in the middle line, and not involuted to form the outer wall of the postpalatine air-sinus... Physeteridæ.

Costal cartilages not ossified. The tubercular and capitular articulations of the ribs blending together posteriorly. Cervical vertebræ all free. Pterygoid bones thin, not conforming in their mode of arrangement with either of the other sections.. Platanistidæ.

Costal cartilages firmly ossified. Posterior ribs losing their capitular articulation, and only uniting with the transverse processes of the vertebræ by the tubercle. Anterior (2—6) cervical, in most, ancylosed together. Pterygoid bones short, thin involute, to form, with a process with the palatine bone, the outer wall of the postpalatine air-sinus.................................Delphinidæ.

DELPHINIDÆ.

This family is most numerously represented by species in the order. The genera are also numerous. Those represented in the ocean bordering North America are the following:

I. The phalanges numerous.
Pectoral fins, long narrow, on the lower part of the sides; cervical vertebræ consolidated; the teeth few, obtuse; dorsal fin ....Globiocephalus.

II. The phalanges not more than 4—5 in the same digit.
α. Two or more cervical vertebræ consolidated.
β. Teeth cylindric.
δ. Beak of skull short, broad; teeth few, large; a dorsal fin.
Teeth early deciduous ....Grampus.
Teeth permanent, acute..Orca.
δδ. Beak of skull elongate, exceeding brain case; teeth small, numerous.
Dorsal fin present; teeth long, more or less acute....................Delphinus.
Dorsal fin none; teeth as last ....Delphinapterus.
Dorsal fin ? teeth short, obtusely rounded..............................Sagmatias.
ββ. Teeth compressed, spade-shaped.
Dorsal fin present..Phocæna.
Dorsal fin none ....Neomeris.
αα. Cervical vetebræ all distinct.
β. No dorsal fin.
Teeth little deciduous; incisors normal.................................Beluga.
Teeth deciduous, except one incisor, which is prolonged into a tusk.
Monodon.

GLOBIOCEPHALUS Gray.

The "black-fish" of whalers are included in this genus; the species represent it in all seas as yet known. They differ less in remote regions than the species of some other genera do. The species of the eastern coasts of North America appears to be the same as that found on the coasts of Europe, the G. melas. The species of the Pacific coasts is fortunately so fully described by Capt. Scammon, that it can be distinguished very readily from those heretofore recorded.

Globiocephalus scammonii Cope.

For details of character of this abundant species I refer to Capt. Scammon's description, and only contrast it here with the species to which it is allied. It pertains to the section of the genus characterized by the absence of white band or other mark on the abdomen, and is among these one of the most uniformly black species. Its more numerous teeth $\frac{10-12}{8-10}$ distingulsh it from G. machrorynchus of the South Seas. In Gray's Catalogue three species remain for comparison, the G. chinensis, which probably does not belong to the genus; the G. sieboldii, which, not being described, cannot be regarded as valid; and G. indicus Blyth. The measurements of the latter indicate a much wider pectoral fin, a longer and lower dorsal fin, and considerably wider flukes. The measurements given by Blyth are as follows:

	Ft.	In.
Total length	14	2
Width flippers	2	6
Length dorsal	2	6
Depth "		11
Extent of flukes	3	

It inhabits the Bay of Bengal.

The present species is named in honor of Capt. Scammon, who has furnished us with a mass of information on the subject of the Marine Mammalia, and an amount of novelty in connection with it seldom equalled in the history of zoology.

ORCA Gray.

The species of this genus are the wolves of the ocean, and occur in all seas, swimming in small companies, and living by violence and plunder.

Two species of the genus are described briefly by Capt. Scammon, which differ from each other much as the two Atlantic species do, in respect to the form of the dorsal fin. In one in each case the fin is exceedingly high and erect, in the other broader, more oblique and less elevated.

ORCA RECTIPINNA Cope.

The dorsal fin extremely elevated—"six feet or more in the larger males," whose length "averages 25 feet" at right angles to the axis of the body, and one-third the length from the end of the muzzle. Muzzle slightly acuminate. Color black, more or less white below ("most in females") with white lines on the sides from the eye sometimes to the hinder margin of the dorsal fin. ? No large white spot behind eye. This species appears to be distributed from California southwards.

ORCA ATER Cope.

The dorsal fin much shorter, wider, and more obliquely directed. Black, with a large white spot behind the eye. Muzzle ? not acuminate. ? A brown dorsal crescent behind fin.

The North West coasts from Oregon to the Aleutian Islands.

The species of this genus from the Atlantic Ocean, whose colors are known, reverse the arrangement existing in the Pacific species. According to Lilljeborg, the O. gladiator has the straight elevated fin, and the large white spot on the side, while the O. eschrichtii, which has the less elevated and oblique fin, does not present this peculiar mark. In both these animals the belly is white, as is also the case with O. eschrichtii. In O. ater the inferior surfaces appear to be entirely black, or nearly so.

It will no doubt be found to be the case with both these Orcas that their females will have less elevated dorsal fins than the males. This is known to be the case with the Atlantic species, as described by Eschricht and Reinhardt.

DELPHINUS.

Many species of true dolphins have been described as inhabiting the Pacific Ocean, by French and American travellers. Those enumerated by Capt. Scammon are not sufficiently described to be identified. They are probably the following:

DELPHINUS OBLIQUIDENS Gill.

Lagenorhynchus obliquidens Gill, Proc. Acad. Nat. Sci. Phila. 1865, 177. The Bottle Nose Grampus, Scammon.

? DELPHINUS STYX Gray.

Zoology, Erebus and Terror, Tab. Cope, Proc. Acad. Nat. Sci. Phila, 1866, 201. Common Porpoise, Scammon.

The cranium described by me as above accompanied one of the Phocæna vomerina Gill, and was, like it, covered with a dark varnish, which is not the case with any other specimen in the Museum of the Academy. Whether it really came from the California coast or not is entirely uncertain. It is equally uncertain whether it is the species mentioned by Capt. Scammon, in case this should prove to be the fact. It is a species of the size and proportions of the typical dolphins or porpoises.

DELPHINAPTERUS Less.

DELPHINAPTERUS BOREALIS Peale.

Cassin's Mammalogy, U. S. Expl. Ex. 30, Tab. vii, 2.

This species was taken in the North Pacific, nearer the coast of Oregon than any other land. It may possibly be the Right Whale Porpoise of Scammon.

PHOCÆNA Cuvier.

PHOCÆNA VOMERINA Gill.

Proc. Acad. Nat. Sci. Phila. 1865, 178.

This well defined species is the Bay Porpoise of the present essay.

BELUGA Lacep.

Capt. Scammon has not given any definite characters by which the species of this genus occurring in Northern Pacific waters may be distinguished. I take, however, the present opportunity to make public descriptions of two species of this genus from the Arctic Seas. They have been already described by me, but rather briefly. First is the BELUGA RHINODON Cope, Proc. Ac. Nat. Sci. Phil., 1865, 278.

The cranium is peculiar for the breadth and shortness of the muzzle and its sudden contraction; the fewness of the teeth; the large extent of the vomer produced behind the palatines; and the long proportion of the maxillaries in front of the nares uncovered by the intermaxillaries.

The length of the muzzle to the notch equals the distance from the latter point to the crest at the inner extremity of the os parietale; its breadth at the same point is about three-fourths the length and less than the width of the cranium at the orbits. The prenarial exposed portion of the maxillaries is parallelogrammic, the length about two and a half times the width, and extends very nearly to a line connecting the fundus of the maxillary notches. The maxillaries present no other carinæ than a short one on each side the o. o. nasalia.

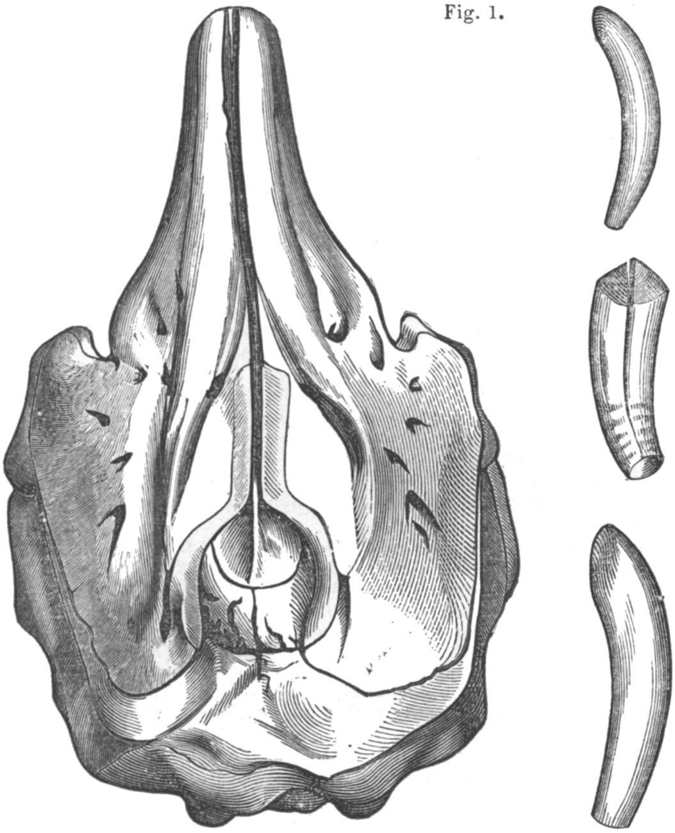
The premaxillaries terminate opposite the posterior extremity of the vomer, and are deeply grooved for the outlines of the "triangle," which terminates with the basal third of the muzzle. They are one-third wider than the maxillaries (from a vertical view) at the middle of the muzzle, where the contraction is strongest, and form with them an arch of nearly 180° width at the internal foramen three-fifths width from outer margin to notch of maxillary.

The median portion of the palatines is narrowed, and with an inner angle just prevent the contact of the maxillaries and vomer. The outer wing is also narrow, and impressed externally with a broad groove; it extends as far as opposite the squamosal process. The latter bone is not in contact with the postorbital process, and presents a large internal lamina, which overlaps without touching the alisphenoid. Posterior upper vomer plate with the deep corner emarginations seen in Phocæna.

Posterior temporal crest not developed; exoccipitals flat, slightly concave externally. Supraoccipital with two large fontanelles and above the foramen two impressions for insertion of muscles. Line to the weak spine straight, Crest not developed; frontal band broad, flat; knob above nasals slight.

	In.	Lin.
Length from end of muzzle to concavity of occ. condyle.	16	0·8
" " " occipital spine	14	8·8
" " " nares	9	10
" " " maxillary notch	7	7·5
" of temporal fossa	5	1
" of orbit	1	11·4
" of ramus mandibuli	12	
" of gonys	1	9·5
Breadth at distal 2-5ths of muzzle	2	5
" at notch	5	6
" at orbits	8	11·4
" at frontal margins	8	6·8
" of foramen magnum	2	2·5
" of paroccipital alæ	7	2·8
" of external nares	2	2·2
Teeth	$\frac{4}{6}$	

Fig. 1.



Behind the alveoli of the O. maxillare is an indication of a groove, as though a full series of teeth had existed in early life, and been shed. and the alveoli obliterated by deposit of bone. This appearance is, however, deceptive, as the teeth in these animals are not developed from deep seated capsules, but more superficially ; perhaps a few very weak teeth were supported by the integument posteriorly. In B. declivis, where the posterior teeth are mainly so held in position, the alveoli are very distinct.

In the teeth of the B. rhinodon certain specific characters may be noticed ; though the animal is much smaller than the B. declivis, the teeth are quite as large and as much worn. The median or vertical mandibulars, instead of a conic or curved crown, terminate in a broad, rounded, slightly elevated summit ; the form of these teeth is clavate. A pair of the oblique mandibulars have a similar form.

	In.	Lin.
Cervical vertebræ	7	4¾
Dorsal vertebræ	10	17
Lumbar (imperforate)	12	30⅜
Caudal (perforate by lateral foramen)	6	11¾
Caudal from first wanting neural spine	11	14½
With cranium.		16
Total	7 ft. 10⅜ in.	

The atlas is characterized by the nearly equal width of the portion of the neural canal above and below the constriction, the narrowness of the wing outside the articulating surfaces, and the elongation of the latter. The inferior apophysial articular surface is broad, rounded, and separated by a high ridge from the anterior face of the inferior limb. The inferior lateral process is opposite the middle of the articulating surface; it is short, obtuse; the superior is small, acute.

Width of canal above constriction	2	2·6
" " below "	2	2·6
" wing from posterior articular surface		6
Vertical diameter of posterior articular surface	2	3

The body of the axis is short, and the lateral alæ longer and thinner than in the angustata, though not extending so far beyound the articular facets. The inferior articular surface is longer than broad and occupies two-thirds the surface of the body. The neural spine is short, flat, and terminates obtusely, over the penultimate cervical. The zygapophysial articulation marks three-fifths the distance between the external alar angle and the tip of the neural spine.

	In.	Lin.
Total transverse diameter	6	10·2
" of centrum	2	4.
Heighth of neural canal	1	8·2
Length of neural spine	2	1·2

Of the remaining cervical vertebræ, the third is distinct, and has very short lateral processes, the superior longer, originating with the neurapophysis from a very broad base. Its neural arch is completed above by a loose suture. The superior lateral process diminishes and is reduced to nothing on the fifth, appears higher up on the sixth, and commencing at the zygapophysis on the seventh is very elongate and much recurved, its extremity being opposite the articulation of the fourth or fifth. The inferior lateral process increases to the fifth, where they are nearly cylindrical, three-quarters inch long by a half broad, and directed downwards at an angle of 45°, These processes rapidly diminish and are reduced to nothing on the seventh vertebra.

Dimensions of seventh cervical vertebra:

	In.	Lin.
Length of body		7·4
Transverse diameter of same	2	6·2
" " of neural canal	2	7·8
" extent of diapophysis from canal	1	10·8
Height of neural canal	1	7·4

The dorsal, as well as the other vertebræ, are distinguishable from those of the other species by their great breadth as compared with their length. The costal articular surfaces of the centra are not distinct.

Dimensions of the third dorsal:

	In.		In.
Length of body	1⅜	Span of neural arch	2¼
Anterior vertical diameter	1 4-8	Width " "	
Anterior height of canal	2 1-8	Heighth neural spine (from behind)	¾
Breadth canal at diapophysis	2 6-8		

The lumbar vertebræ possess longer diapophyses than those of the angustata and concreta, which are also less dilated distally on the anterior margin. That of the first is nearly truncate.

Its dimensions are:

	In.		In.
Length body	2 3-16	Same to posterior extremity	3½
Anterior transverse diameter	2⅛	Floor of canal to zygapophysis	2 1-16
Height canal (anteriorly)	1 15-16	Zygap. to apex of neural spine	2 7-16
Width at diapophyses	1¾		
Epiphysis to anter. extremity of diapophysis	2 15-16		

The fifth or typical lumbar offers the following proportions:

	In.		In.
Length of body	2 7-16	Breadth diapophysis distally	1 13-16
Anterior breadth	2⅜	Height of canal	1⅝
Length of diapophysis	4⅛	Zygapophysis to apex neural spine	2⅜

The series of caudals diminishes gradually in size to the last.

The dimensions of the fourth (perforated) are:

	In.
Length body	1 3-16
Transverse anterior diameter	2⅜
Neural arch and spine	1⅞

The neural canal is laterally compressed, or oval. The articulating ridges of the epiphyses and corresponding vertebral bodies are fewer, coarser, and more elevated in this species than in the augustata. In the latter they are more delicate, and have a less number of complete radii.

There are ten pairs of ribs as in the catodon, one pair less than in the concreta. The first is destitute of the anteriorly curved angular process of the catodon, but the tubercle is on an elevated base. The sixth, seventh and eighth ribs are flat on the posterior face; the last three are without neck and head, and this portion of the seventh is much less than the same of the sixth; in the seventh also the angle is furthest from the tubercle. The anterior ribs are not so dilated at the extremities as in the augustatus.

	In.	Lin.
First rib; head to angle	3	5
" " angle to extremity	5	1
Seventh rib; length	17	10
" " "	12	6

The stylohyal of the specimen of this species is of relatively the same size as that of the angustata, but is flatter, less narrowed at its anterior extremity, not swollen on its posterior border, nor constricted at its posterior extremity. Its hinder border is somewhat rugose. The body and posterior hyoid cornua are much like those of the angustata and declivis and coössified.

	In.	Lin.
Length of body	2	1
" " stylohyal	4	1
Expanse of posterior cornua	6	6

The sternal pieces are separate. The anterior has been found like that in the angustata, with equally strong lateral vertical processes. The hæmapophyses are relatively shorter than in concreta; the fourth wants the produced thin anterior margin of the third, and is about the same length as the fifth. Sixth, slender, flattened.

	In.	Lin.		In.	Lin.
Length of first hæmapophysis	4	8	Length fifth	6	3
Width " " (medially)	1	2	" sixth	6	4
			" anterior sternal segment	4	
			Breadth " " "	3	11

The scapula is not different from that of the angustata. The brachial and antebrachial elements are in this species also identical with those of the angustata; in the specimen from Upernavik the epiphysis of the humerus has not coalesced, while it is completely united in that of the latter species. In both the exterior (bicipital) process is more prominent and occupies a less portion of the circumference than in the concreta. The humerus is also much constricted in both except on the exterior aspect.

	In.	Lin.
Length of humerus	3	10·9
Diameter at condyle	1	11
" at distal articular surface	1	10·9
Length of radius	3	3·5
Breadth "	1	8

Habitat, Baffin's Bay.

A skeleton of this species in the Museum of the Academy of Natural Sciences was brought by Dr. Isaac I. Hayes, from Upernavik, Greenland, in lat. 74°.

I was at first disposed to regard this as a young individual of one of the species under observation, perhaps of B. angustata or declivis. A very brief study was sufficient, however, to reveal its manifold differences from these. In cranial features it resembles most the B. declivis, but I am satisfied that no such difference in the form of the muzzle of the cranium as obtains here can exist between young and adult of the same species.

BELUGA DECLIVIS Cope, Proc. Acad., Phila., 1865, 278.

This species resembles the angustata in the general proportions of the cranium; the muzzle is relatively shorter in the specimen, and its margins decurved toward the end; it therefore resembles also the catodon, which has much less marked maxillary notches, a different prenarial space and shorter, heavier mandible. The inferior view presents some analogy with that of the B. rhinodon, in the largely developed vomerine tablet; but the palatines are even further separated by an interval of three-quarters of an inch. The horizontal palatal surface of these bones mark a narrow incurved longitudinal process only, and they appear in the inferior half of the anterior wall of the nasal meatus, as narrow strips lying next to the vomer. The pterygoids are nearly exactly parallelogrammic, their exterior angles alone in contact on the horizontal plane. The exposure of the premaxillaries extends, as in the other species, to beyond opposite the fifth maxillary tooth. Of the superior portion of the palatines the anterior portion extends to opposite the notch; the vertical portion of the posterior ala is broader than the horizontal. The middle of the palate is prominent without lateral angulation. The proportions are explained by the following measurements.

	In.	Lin.
Length from end of muzzle to convexity of condyle	22	
" " " " occipital crest	21	5
" " " " nares	15	3
" " " " maxillary notch	10	7
" " foramen magnum to occipital crest	4	5
" of temporal fossa	7	
" " orbit	2	8
" " ramus mandibuli	16	7
" " gonys	2	9
Breadth at distal two-fifths muzzle	3	6
" " notch of maxillary	7	7
" " orbits	11	6
" " frontal margins		
" of foramen magnum	2	
" " external nares	2	9
" between apices of paroccipital crests	9	
Teeth	$\frac{10}{9}$	

The sella turcica is little marked, and the suture between the sphenoid and presphenoid distinct, as indicated in the figure in Huxley's Elem. Compar. Anat. 277. The teeth are relatively much smaller than in the concreta, and the posterior but loosely attached to the alveolæ, being principally held in position by the palatal integument. The anterior above are considerably worn on their inner faces.

The tympanic and periotic elements are much like those of the rhinodon, and though the latter is known from a much smaller animal, its tympanic bone is about the size of that of the former. The only noticeable difference is the greater elevation of the proötic.

The corresponding portions of the Beluga angustata are larger and considerably heavier, though the cranium is a little less in all dimensions than that of the declivis. The opisthotic process is more prolonged than in the others, and the region around the foramen for the seventh pair is very rugose and gives rise to a process behind the formen. The proötic is acuminate anteriorly, and ends in an acute process. The inner lip of the tympanic is much elevated at its anterior extremity, causing the profile of this extreme of the bulla to be truncate instead of accuminate; the Eustachian sinus is thus shorter and broader. Of the longitudinal lobes of the inferior surface of the bulla, the interior is weaker and the external more prominent and narrower than in the declivis. The anterior end of the inferior view is broader, more oblique, and more truncate than in the other species.

	angustata.	declivis.	rhinodon.	Steno frontatus.*
Length of tympanic bulla	1 in. 11 l.	1 10	1 9·5	1 7·5
" " other elements	2 3·5	1 11·5	1 10	1 4·5
Total depth	2	1 8	1 7·5	1 3

General Measurements.

	No.	In.	Lin.
Cervical vertebræ	7	7	3
Dorsal "	11	28	7
Lumbar (to 1st chevron bone)	10	40	
Caudal (imperforate)	1	3	7
Caudal (perforate)	18	31	9
Caudal (from first wanting neural spine)	(11)		
With cranium		22	
Total 11 ft. 1 in. 2 l.		133	2

The cervical vertebræ are in general similar to those of B. angustata; they present the same acute infero-posterior process of the atlas, short truncate inferior lateral processes and longer but weak superior lateral. As in it the last is longest and recurved to opposite the sixth. There is nowhere a vertebral foramen. They differ from those of the angustata in the heavier proportions of the atlas and axis, and the high compressed carinate neural spine of the latter. The axis is also peculiar in that the inferior (circular) surface of articulation with the atlas process occupies a median position of the inferior face, and is separated by a deep groove from an anterior transverse articular surface, which belongs to an apparently decurved odontoid process. The latter fits a corresponding and separate surface just behind the margin of the spinal canal of the atlas.

Width of spinal canal above	2	8.5
" " " below	1	8
Transverse diameter of atlas	7	10·5
Vertical " "	4	1
Transverse diameter of axis	7	0·8
" " of centrum of do.	2	10·5
Height of neural canal	1	8
Length of neural spine (superiorly)	3	5 7

The neural canal is rather depressed, and angulate above; the arches of the fourth and seventh are incompletely united above, and the latter has a trace only of neural spine. Its dimensions are

Length of body		11
Transverse diameter of same	2	6·4
" " " neural canal	2	9·5
" extent of diapophysis from canal	1	11
Heighth of neural canal	2	2

The dorsal vertebræ are not so short as in the B. rhinodon, and the neural spines are low; seven of them furnish an entire articular surface near their posterior border for the ribs, commencing with the second pair.

The lumbars are heavy, and have long diapophyses which are dilated distally, anteriorly, as in angustata and concreta. The diapophysis of the first is obliquely truncate, and furnishes a ligamentous attachment to the angle of the last rib.

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* From specimens described in Proc. Acad., Phila., 1865, p. 204.

Its dimensions are :

	In.	Lin.
Length body	3	6
Anterior transverse diameter	2	10
Height of canal	2	1
Width do. at diapophyses	1	10
Epiphysis to anter. extrem. of do	4	7

	In.	Lin.
Same to posterior extremity	5	10
Floor canal to zygapophysis	2	9
Zygapophysis to apex of neural spine	4	1

Of the caudals, the last five are transverse.

The dimensions of the fourth perforated are as follows :

	In.	Lin.
Length of centrum	2	9
Transverse anterior diameter	3	4
Neural arch and spine	1	10
Hæmal arch and (very low) spine (from centrum)	1	7
" " length	1	10
Diapophysis projection		8

The neural canal is compressed.

The radiating ridges of the epiphysial articulations on all the vertebræ are very coarse and much broken up into mammillæ.

The coössified body and lesser cornua of the os hyoides do not resemble those of the angustata as much as the latter do those of the rhinodon. The body is not so long as its greatest breadth, and the surface articulating with the cornua the shortest of all. Viewed from below, the posterior area is one-half the anterior (equal in angustata) has a heavy double posterior margin, and is marked by a median process. The cornua are of nearly equal width throughout, and not expanded on the margins. Their proximal extremities would have a trigonal section, owing to their inferior thickened angle.

	In.	Lin.
Length body	3	1
Breadth "	3	7
Length of cornu	3	7
Expanse of cornua	8	9

There are eleven ribs, of which the three posterior have no head, and the first articulates by head with the seventh cervical vertebræ. The first, like that of B. angustata, has the tubercle on a backward curved process. The superior half of the shank of this rib is thin and expanded on its outer margin, while on the lower half it is obliquely flattened. The ribs from the second to the fifth are considerably dilated distally; the posterior aspects of sixth, seventh and eighth are rounded.

	In.	Lin.
First rib ; head to base of angular process	1	10
" length of " "		8
" base of process to dist. extremity	7	10
Seventh rib ; length	24	5
Last " "	16	10

Seven pairs of ribs are attached to bony hæmapophyses, of which five pairs articulate immediately with the sternum. The first is smooth, flat, and dilated distally ; the second narrower and thickened distally ; the third is dilated and sharp edged on the middle of the anterior border. The penultimate has a slight curvature, and the last is cylindrical and very slender. The sternum is yet distinguished into three principal pieces, the last narrowest and longitudinally divided. The articular cavities are at the sutures except the two anterior, which are close together at the front of the anterior piece. The latter has a cordate anterior outline, no cornua, and a convex posterior suture.

Dimensions :

	In.	Lin.
Length of first hæmapophysis	5	
" fifth "	8	3
" last "	7	3
" anterior sternal segment	6	4
" median " "	3	5
" posterior " "	3	7
Breadth of anterior " "	6	7

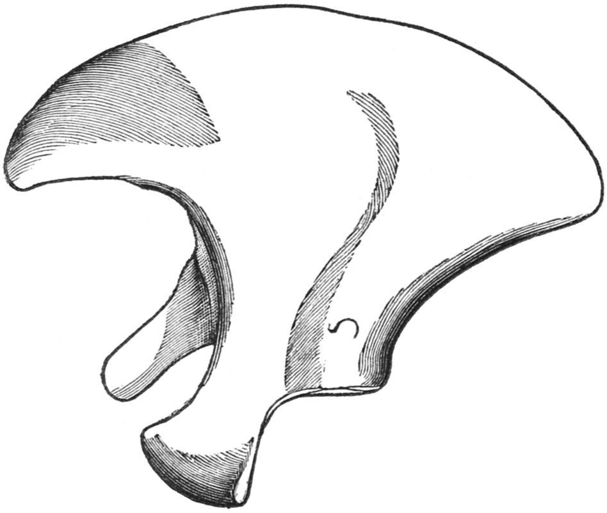

Fig. 2.

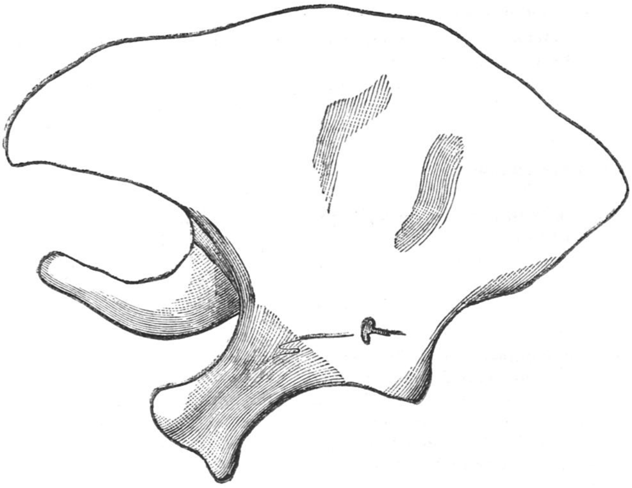

Fig. 3.

One of the chief peculiarities of this species, and that from which it derives its name, is seen in the scapula. On placing the glenoid cavity in the same plane with that of the scapula of the angustata, the acromion is observed to be in the general plane of the scapula, and not deflected inward, and to be shorter and much decurved. The coracoid is also decurved so as to be nearly parallel with the acromion; the extremities of the two are connected by a strong ligament. This direction of the coracoid is the opposite of what is seen in most other Delphinidæ, and all others of this genus, where it is recurved and acuminate.

The superior sinus, while more deeply incised than that of the augustata, is much more open, having divergent, instead of parallel outlines.

	In.	Lin.
Greatest length of scapula	12	10
Glenoid cavity to anterior angle	7	9
End of coracoid " "		5

The deltoid process of the humerus is as wide as the condyle. Olecranon distinct. There are two large carpals opposite the inferior digits, and three smaller of the outer row, opposite the second, fourth and fifth respectively. The three inferior digits are more closely approximated in the fluke than the two superior. Phalanges (counting from above), 3—4—5—4—3; fourth digit longer than second.

	In.	Lin.
Length humerus	5	1
" ulna and radius	4	2
" carpus and third digit	7	7
Breadth at carpus	4	7

The only specimen of this species at my disposal is not fully adult, as the vertebral and humeral epiphyses are not yet anchylosed. It was brought by Dr. Elisha K. Kane, on his return from the arctic regions, from what precise locality is not stated. He presented it to the Museum of Comparative Zoology, Cambridge, Mass., whence it was kindly lent me by Dr. Alexander Agassiz, to whom my acknowledgements are due.

PHYSETERIDÆ.

HYPERAODON Lacep.

No species of this genus from the Pacific Coasts is mentioned by Scammon, but the present is embraced as an opportunity of alluding to the species of the Eastern coasts of North America.

In the Proceedings of the Academy 1865, p. 280, I characterized briefly a whale of this genus under the name of H. semijunctus, which is represented by a specimen in the Museum of the College of Charleston, So. Ca. The characters furnished are meager, and it was anticipated that opportunity would soon have occurred to amplify them. This has been, however, disappointed, but is still looked forward to.

Two years ago two individuals of this genus entered the harbor of Newport, R. I., and after a lively chase one of them was captured. It measured twenty-seven feet in length. Its bones were preserved, and some of them, including the cranium, have been sent to the Academy of Natural Sciences, through the attention of its member, Saml. Powell, of Newport. He has also sent numerous photographs of its carcass, taken just after its capture, from various points.

These render it evident that the species is quite distinct from that described by European authors as H. rostratus (or H. bidens). Its most striking feature is the relatively longer and more slender beak, and less elevated and prominent front. This is obvious on comparison with the figures of Hunter, of Deslongchamps (Mem. Soc. Normandie) of Gray, (Zool. Erebus and Terror) and of F. Cuvier (Cetacea) and constitutes a material distinction. Thus, in the Newport specimen, it is one-twelfth of the length, or 2¼ feet; equal three-fourths the distance between the eye and the spout hole. In a Cape Cod specimen it measures twenty-two inches in a length of twenty-four feet. The prominent swollen front is in the Newport whale, considerably compressed, and the eye is placed in a strong longitudinal prominence on each side of the head.

The dorsal fin, as in Deslongchamp's specimen, is small, and posterior. The caudal fluke is not emarginate. The color is dark, deeper above than below. It remains a question whether this is the H. semijunctus. The principal character on which that species rests is the non-coössification of the posterior four cervical vertebræ, a very remarkable character, and one which leads to the question of its pertinence to the genus. The cervical vertebræ of the Newport specimen are entirely coössified. The same character is furnished by a second specimen.

This is the skeleton preserved in the Museum Compar. Zoology at Cambridge, Mass., of an individual cast ashore during the winter of the present year, at Dennis, near Cape Cod, Massachusetts. It was stripped of its blubber by Perez Hall, of that place, who kindly sent me a sketch of it. He stated its length to be twenty-four feet, of which the muzzle measured twenty-two inches: the expanse of the flukes was six feet. The stomach was filled with the beaks of cuttle fish. On inquiry of J. A. Allen, of Cambridge, well known as a naturalist there, I learn that the cervical vertebræ of the animal are solidly coössified, as in the H. rostratus. It is therefore distinct from the H. semijunctus. The photographs are figured for the further illustration of the species. The characters derived from the portions of the skeleton sent by Saml. Powell are as follows:

PHYSETER Linn.

Physeter macrocephalus Linn.

The sperm whale.

This species is one of the few that appear to be distributed over all oceans. Flower does not find those from Australian to differ specifically from those from British seas, and I find no peculiarities by which to distinguish a specimen from our own coast from the latter. This is known from a cranium which was found on the coast of New Jersey and is in the Mus. Compar. Zoology, Cambridge.

Part II.

NATURAL HISTORY

Of the Cetaceans of the seas off the North-West Coast of America, with an account of the Elephant Seal appended.

PREFACE.

Being on the coast of California in 1852, when the "*gold fever*" raged, the force of circumstances compelled me to take command of a brig bound on a "sealing, sea-elephant and whaling voyage," or abandon sea life—at least temporarily.

Finding the object of pursuit in such vast numbers, and observing their natural habits in connection with their capture, it may not be surprising that it led to the study of their history. The few works treating the subject within reach were sufficient to prove that correct knowledge of the different species of whales was very meager, hence it appeared that, by industrious observation, one might reasonably expect to add something to the little known of their habits.

It is to be regretted that among the number of intelligent and observing American whaling masters, none have hitherto attempted to contribute any thing of moment to the history of whales; nevertheless it has in no wise deterred me from putting my observations on paper and, if eventually this humble treatise shall add to what is already known about Cetacea, it will be regarded as an ample reward.

The drawings of the different species where a scale is attached may be regarded as correct in proportions, careful measurements having been taken. All others are the best representations of proportions, and peculiar marks that could be drawn from data obtained.

I have endeavored to confine myself to the simplest and plainest language in description, but in so doing have used whaling terms freely, the definition of which will be found as indicated by reference marks.

Fam. *BALÆNIDÆ.*

I. BOWHEAD WHALE.

BALÆNA MYSTICETUS Linn.

This whale has a geographical distribution east and west, extending from Nova Zembla to the coast of Eastern Siberia. It is rarely seen further south in Behring Sea than the 55th parallel, and in the Okhotsk its southern range is about the latitude of 54°.

The northern limit of the Bowhead remains undefined.

In tracing its history we can revert back to the Dutch and Russian fishery about Spitzbergen anterior to 1615,* and as years passed on it was pursued westward on the Atlantic side to the icy barriers in Davis Strait, and the adjacent waters uniting with the Frozen Ocean.

Right whales were pursued for several years on the North West coast, on the coast of Kamschatka, about the Kurile Islands, and in the Japan Sea, before Bowheads were known to exist in that part of the Arctic Ocean adjoining Behring Strait, or in the Okhotsk Sea.

In the year 1848 Capt. Ross, in the American bark "Superior," was the first whaling master to work his vessel through Behring Strait into the Arctic Ocean, and then found whales innumerable, some of which yielded 200 barrels of oil.

The habits of the Bowhead are much like those of the Humpback, being irregular in its movements, in its respirations, and in the periods of time either above or below the surface of the water. When going gently along, or lying quietly, it shows two portions of the body: the spoutholes, and a part of the back, on account of the high conical shape of the former, and the swell of the latter, which is about midway between the spoutholes and flukes.

The Bowhead of the Arctic may be classed as follows: 1st. The largest whales, of a brown color, average yield of oil 200 barrels. 2d class, smaller, color black, yield of oil 100 barrels. 3d class, the smallest, color black, yield of oil 75 barrels.† This last named class are generally found amongst the broken ice the first of the season, and they have been known to break through when it was three inches in thickness, that had formed over previously upon water between the floes. They do this by coming up under and striking it with the arched portion of their heads. Thence they have been sometimes called "ice-breakers." In point of color, all are found with more or less white on the under side, especially about the throat and fins. The Arctic Bowheads may average from 40 to 65 feet in length.

I am indebted to Capt. J. F. Poole, of the whaling bark "N. S. Perkins," for the following measurements and memoranda of one taken in the Arctic, August, 1867:

Sick female, color black on back and sides, throat white, also occasional white spots on under side of body. Yield of oil, 80 barrels. (The whale was judged large enough ordinarily to have yielded 150 barrels.

	Ft.	In.
Length of animal	47	0

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* Subsequent datum enables me to date back to 1608.

† We do not mean to convey the idea of *species* when mentioning classes, as all observers of our acquaintance agree that the difference in size and shade of color arises from difference in age.

	Ft.	In.
Length of pectorals	8	
Breadth "	4	
Distance from nib end to spoutholes	16	
Length of spoutholes	1	
Distance from corner of mouth to nib end	16	
Breadth of flukes	19	
Thickness of blubber		16
Average thickness of blubber		11
Thickness of black skin on back		1
Length of genital slit	1	10
Dist. from " " to arms		4
" " " " to flukes	9	
Length of longest bone or baleen	10	6
" of fringe or hair on bone	2*	
Breadth of widest bone		13

Bone is embedded in the gum of the jaw ten inches.

Weight of largest slab of bone, seven pounds.

Number of layers of bone on each side of jaw, 330.†

Bone extends back of spoutholes in throat, three feet; falls short of nib end one foot.

Number of teats, two.

The tongue is very fat, yielding one-tenth as much oil as the whole of the "body blubber."

All Bowheads found on this cruising ground are quite free from parasitic crustaceans, as well as barnacles.

Whalers bound to the Arctic are generally at the "edge of the ice," which is met with, near lat. 60°, about the 1st of May. They then work their way northward as fast as the ice will permit, keeping as near shore as practicable in order to be on the best "whale-ground," and also to avoid the ice. Many whales were formerly taken off Karaginski Island, lat. 59°, on the coast of Kamschatka.

Behring Strait is sufficiently clear of ice from the 1st to the 20th of July for ships to navigate with comparative safety. A large fleet collect, and grope their way through ice and fog into the Arctic (as termed), and frequently reach the high latitude of 72° N. Occasionally an open season occurs, when they hazard their ships around Point Barrow. Capt. Roys entered the ocean the middle of July, and left the 28th of August, but at the present time ships remain till October.

The principal herding places of the Bowheads in the Okhotsk are at the extremities of this great sheet of water, the most northern being the North-East Gulf (Gulf of Ghijghi), the most southern, Tchantar Bay. The whales do not make their appearance in North-East Gulf so soon as in the bay. Whalers endeavor as soon as possible to get to the head of Tchantar Bay, where they are sure to find the objects of pursuit in the intermediate water between the ice and shore, long before the main body of the congealed mass is broken up, and before the ships can get between the ice and the shore, even at high tide, the boats being sent forward weeks previous to the ships. Soon after the ship's arrival the whales avoid their pursuers by going under the main body of ice situated in the middle of the bay, finding breathing holes among the conglomerate floe. The boats cruise about the edge of this barrier watching for them to emerge from their cover, which occasionally they do, and are given chase to instantly. Frequently, in sailing along this field of ice, you hear distinctly the sound of whales blowing among it, when no water is visible at the point from whence the sound comes. The first of the season, before the ice breaks up and disappears, when there are "no whales about," the question is frequently asked, " where are the whales?" and as often answered, " they are in the ice," and " when do you think they will come out?" " when the ice leaves." It has been established beyond question that this species pass from the Atlantic to the Pacific, or rather, if we may be allowed the expression, from the Atlantic Arctic to the Pacific Arctic, by the north; and, too, it is equally certain that numerous air holes always exist in the ice that covers the arctic waters, even in the coldest latitudes. These fissures are caused by the rise and fall of the tides, and storms acting upon the water hundreds of miles distant has its influence in rending asunder the icy fetters of those frozen seas. It appears to us not improbable that the Bowhead or Polar Whale has a feeding and breeding ground in an open polar sea. And as they have never been seen during the winter months in any other quarter of the globe except as before mentioned, it would appear that they must either remain among the rough water and broken ice at the southern edge of the winter barrier, or migrate to some remote sea unknown to man. Hence may not the clear water that Kane saw after passing the coldest latitudes as he pressed northward, be the winter home of vast numbers of these gigantic animals?

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* Two feet may be regarded as nearly twice the usual length.

† 330 may be a fair average, and 370 is the highest number we have counted.

OKHOTSK SEA BOWHEADS.

The preceding remarks have been confined chiefly to the Bowheads of the Arctic in the vicinity of Behring Strait, north and south.

The Okhotsk Sea at one time equalled, if not surpassed, the Arctic as a productive whaling ground. Our memorandum does not state with certainty what year Bowheads were first taken in the Okhotsk. It however was not earlier than 1847, nor later than 1849.[*]

They were found to be easy of capture, and yielded a large amount of oil and bone. On making further explorations the whales appeared in great numbers, and, from the peculiar shape of the head, the spoutholes terminating in a sort of cone, they were at that time called " steeple-tops."

But few years elapsed before a large fleet were pursuing the animals throughout the whole extent of this vast inland water.

Tchantar Bay, Taousk and Penjinsk Gulfs soon became noted whaling grounds, as well as several other points about the coasts. The whales of this sea, as far as known, are the same species as those of the Arctic, although in the bays are found, in addition, a very small whale called the Poggy, which yields but little oil (20 to 25 barrels).[†] Many whalemen are of the opinion

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[*] Capt. J. H. Swift, who was cruising in Behring's Sea about the year 1847, is quite positive that the French ship "Asia" was the first to take Bowheads in the Okhotsk (in 1847). Capt. Roys, of Arctic notoriety (spoken of in this paper), in a recent interview seemed equally certain that the "Asia" was not the first to take Bowheads in the sea. He thinks none were taken till 1848 or 1849, and that the American ship " Huntsville," Capt. Freeman Smith, was about the first, if not the *first*, to take Bowheads in that region.

In justice to both of these experienced and very intelligent whaling masters, it is desired to make mention that I am under much obligation to them for valuable data in relation to several species of cetacea, more especially as they are regarded as very correct and close observers of the *habits of whales*.

[†] We are convinced that there are two species of Bowheads, which are found on the same ground. The difference from the animal above described is a bunch or sort of hump which rises from the top of the *small*, which is situated about six feet forward of the flukes, and extending along the top of the back or small two to three feet, and in some individuals rises in the highest place about six inches. The accompanying sketch will better represent the difference in shape, perhaps, than a written description. Capt. Roys says he has frequently taken them in the Arctic as well as in the Okhotsk. They have been frequently taken in the *North East Gulf* (Okhotsk sea). Our personal observation was only on a dead one in Tchantar Bay (1862), and upon that individual the protuberance was so slight that it would not have been noticed unless our particular attention had been called to it. Capt. Randolf, of the American whaleship "South Boston" (1862), informed me at the the time that nearly all the whales he had taken that sea on in the N. E. Gulf were of that description, and yielded a very large amount of bone in proportion to yield of oil.

Capt. Roys also mentioned that one season he took numbers of them, and to distinguish them from others they were then called " Bunch Backs." Several whaling masters who that these are a different species. There is little doubt, however, of their being young whales of the same species, as their blubber is close and fine, producing but little oil in proportion to size of body, as is the case with all calves or young whales of every description.*

Bowhead Whaling.

In the Arctic and about Behring Sea *the whaling is done from the ship*, as it is termed, *i. e.*, the vessels cruise and the look-out is kept aloft as usual, and when whales are seen, the boats are lowered and the pursuit is carried on in sight from the ship, unless obscured by fog. In the Okhotsk much of the whaling is about the bays, particularly Tchantar Bay, and contiguous waters. The nature of the enterprise is such, in these localities, that the *modus operandi* is quite different.

Vessels bound to Tchantar Bay endeavor to approach the land of Aian if the ice will permit, which is generally sufficiently broken and scattered by the 20th of June; then, working along between the ice and the Siberian coast to the southward as far as practicable with the ships, they dispatch boats to follow along the shore and if possible to reach the head of Tchantar Bay, where whales in former years were expected to be found in large numbers. These boat expeditions were attended with excessive labor, much exposure, as well as risk to the crews. Frequent instances have been known of boats leaving the ships off Aian, then threading their way along the coast, between the masses of ice, or between the ice and shore, as the ebb or flood tides would permit, till they reached the head of Tchantar Bay. As soon as arrived there, finding whales plenty they would immediately commence whaling, and by the time the ships arrived, in several instances, whales enough had been taken to yield 1000 barrels of oil. The elapsed time from leaving the ship till again joining the vessel in the bay would vary from one to three weeks. All this time the boats' crews lived in or around their boats, beng afloat when making the passage or when engaged in whaling; and when driven to the shore by the ice or by stormy weather, or resorting thither to cook their food or sleep, the boats are hauled up and turned partially over for shelter, and tents are pitched with the sails. Fallen trees or drift wood furnish abundance of fuel, and by a rousing fire all sleep soundly when opportunity offers; but if whales are in abundance, the less sleep for the whalemen, in those high latitudes, where daylight lasts nearly the twenty-four hours of each day during the summer.

Tchantar Bay Whaling.

Arrived on the ground, whales being plenty, all surplus provisions and outfits are quickly landed, and the chase begins. Frequent spouts in the air tell that the animals are all around. One of the number breaks the smooth surface of the water, between the land and ice, and is at once pursued, but before the boat can reach within darting or shooting distance, perhaps, the animal goes down. Then comes an impatient waiting for it to rise again. As the Bowhead is irregular in its course, when next seen it may be in another direction. Quickly the boat is headed for it, and before approaching near enough the whale goes down again. In this way the chase is frequently prolonged, sometimes abandoned and other whales pursued; or, it may be, when nearly within reach the animal glides under a floe of ice, and evades his pursuers; or, if har-

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have taken them have observed that the spout-holes are usually higher than on those not having the bunch. This statement is corroborated by Capt. Swift. [The figures do not present any characters to distinguish this whale from the common bowhead.—Ed.]

* Capt. Roys is of the opinion that the Bowheads breed but slowly. Moreover his observations of many years in northern whaling goes to show that the young of this species suck but a short time compared with other cetaceous animals.

This opinion seems quite conclusive when we compare the immense head and long baleen of even the smallest individuals with those of other species, as though nature had provided them with immensely capacious mouths to gather insect food instead of drawing sustenance from the dam.

pooned, it may run for the floe, and before being killed reaches it, and escapes with harpoons, lines, &c. If the pursuit proves successful, the captured whale is towed to the beach at high tide, and a scarf is cut through the blubber along the body, a tackle is made fast on shore and hooked to the blubber, then as the tide falls the animal is literally skinned of its oily hide, the carcass rolling down the bank as the process of skinning goes on. The bone is extracted from the mouth as the body rolls over, and presents the best opportunity. As soon as the blubber is taken off it is *rafted*,* and lies in the water till taken on board ship. The water being very cold, the blubber remains in its natural state for a long time, retaining the oil with but small loss. While the whaling is going on in this wise, the captain with the *ship-keepers* improves every opportunity to work the ship to the whales. If there is an opening seen between the ice and shore, the ship is at once worked through either by towing, kedging or sailing, and if meeting an adverse tide or wind the vessel is anchored with a very light anchor, so that if beset by ice unexpectedly in the night or during the dense fogs that prevail, the vessel will drift with the floe, thereby avoiding the dangers of being cut through. Heavy fogs prevail until the ice disappears, and the circumscribed clear water being crowded with ships and boats, much care and manœuvering is exercised to prevent accident. These fogs frequently are so dense that no object can be seen much more than a ship's length; consequently at such times cruising and whaling in the bays is full of excitement and anxiety. A ship may be laying quietly at anchor one moment, and the next she is surrounded by a field of ice, or the splashing of water under the bow of a passing vessel tells of her close proximity. Then comes the blowing of horns, the ringing of bells, the firing of guns, or pounding on empty casks, to indicate the vessel's position, in order to avoid collision.

Neither fog or drifting ice, however, prevents the whalers from vigorously prosecuting their work. In thick weather, when the spout of the whale or the animal itself cannot be seen, its hollow-sounding respiration can be heard a long distance. In such instances the boats approach as near as can be judged where the sound was heard, and if the animal is found and captured it is at the risk of the boats coming in contact with passing ships, ice or what not, and, too, not knowing with any degree of certainty what part of the bay they may be in, the first and main object being to capture the whale at all hazards. This being done it is taken in tow by the boats or is anchored. If taken in tow and not finding their own ship, but meeting with another, the custom is to go on board to eat or sleep, if necessary, and when recruited, or the fog lifts so as to find their own vessel, they are supplied with provisions, if needed, till they can reach her. If anchored, one boat always remains with the whale while the others go in search of the ship. As soon as found the master, learning of the capture, makes every effort to work his vessel to the dead animal; or, if that cannot be done, every favorabte tide is improved to tow the whale to the ship, where it is cut in and tried out in the usual manner. As the season advances the ice disappears, leaving more room for cruising with the vessels, when the fleet becomes more scattered, and the feature of the whaling changes; the boats are kept more with the vessels, look-outs being stationed at the mastheads, and the whaling is principally *done from the ship* (as it is called): sometimes two boats are sent from a vessel to look for whales in an adjoining bay. Meanwhile the nights have become longer. Then comes the night whaling. The phosphorescent light caused by the whale's movements in the water show quite distinctly his whereabouts, and, the Bowhead whales being easy of capture compared with other kinds, *night whaling* has been pursued successfully.

We have spoken of the Bowheads as being comparatively easy of capture, but it must not be inferred that the pursuit is not often tedious or unsuccessful, or the attack made without risk of life and limb, as well as in other kinds of whaling.

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* Tied together with ropes in a sort of raft.

The Bowhead, compared with the other species of whales that *are pursued*, is considered very shy and timid.

After the ice leaves the bays, until the fall winds begin, much calm weather is experienced; and, although we have frequently seen large numbers of whale spouting among a large number of boats scattered over the water, not a single animal could be approached near enough to *dart at* with the hand harpoon, or to present a fair chance to shoot a bomb lance into it, notwithstanding the boats were rigged with extra large sails in order to take advantage of the light airs or winds that may prevail in midsummer. The use of oars or paddles would be quite sure to frighten the whales, and when there is not sufficient wind *to sail on to them* there is but little or no *chance of getting fast.* After the *irons* are firmly planted in the animal, or, as we frequently hear whalemen say, *after the whale has been fastened to, good and solid*, down the creature may go on to the bottom, and there rolls till either the *irons* are torn from its body or the line is wound about it, and the valuable prize may be lost.

The breeding places of the Bowheads seems to be a matter of conjecture among the most observing and experienced whaling masters. The only place known has already been mentioned, in the vicinity of Tchantar Bay, and a difference of opinion exists as to whether the Poggies before mentioned are calves or whether they are not a scrag species that have a corresponding relation to the full-grown Bowheads that the *scrag* Right Whale has to the larger grades of that species. Admitting, however, that they are the young ones, their numbers are comparatively few to the numerous progeny that is supposed to be brought forth by the cows during each season. Another singular fact is that no Bowhead of the Okhotsk Sea have ever been seen passing in or out the passage of the Kurile Islands, or from the Okhotsk to Behring Sea, or Arctic whales passing to the Okhotsk. According to statements of the most experienced whaling captains, a Bowhead with a calf never has been seen by any whalers in the Arctic or Behring Strait, and where this species of cetacean resort to bring forth their young, or where the young remain till grown to a considerable degree of maturity, is not definitely known. The general opinion, however, is that an open Polar Sea must exist, where they resort, or some other open water not known to whalemen.

II. *The Right Whale of the North-West Coast.*

? BALÆNA CULLAMACH Cham.

Numerous species of whales frequent the coast of California at different seasons of the year, and both deep sea, bay and shore whaling has been prosecuted for many years. The shore and bay whaling, however, did not begin till about the time that Upper California became a part of U. S. Territory, and the shore whaling was not pursued to much extent till 1856. The first shore party was established at Monterey, 1852. The varieties of the larger Cetaceans found along the coast are known under the following names: California Gray, Humpback, Finback, Sulphur-bottom, Right Whale, Sperm Whale. The first five mentioned are of the Balæna family, and their natural food is zoophytes, animalcules, "(brit)" mollusks, crustaceans, and small fish.

The Right Whales found on the coast are but few, compared with the numbers found on what is termed the Kodiak ground; the limits of which may be regarded as extending from Vancouver's Island, northward to the Aleutian Chain, and from the coast westward to longitude 150°. The small number frequenting the coast of California are supposed to be only a few stragglers from that region. They have been taken as far south as the Bay of St. Sebastian Viscaino, and off the north point of Cedros or Cerros Island, both within the parallels of 27° and 29° N. The season of the year when seen was from February to April. This animal is thought to be a distinct species from the southern Right Whale, and is frequently called the North-West Whale, being larger, and in several particular points differing from the former. It has ever been a matter of mysterious conjecture with the most philosophical whalemen where this species go to bring forth their young, and where they migrate during the winter months. That they do not go into the southern hemisphere is certain, and it is equally certain that but a few stragglers even reach within a number of degrees of the northern tropic in their wanderings. The same mystery hangs over the breeding place or winter resort of the species of Balæna known as the Bowhead.

The Eskemo about the North Western shores of Behring's Sea speak about that species coming into the bays when the " small ice comes," and they look forward to that season as a time of plenty, and reap a kind of marine harvest by catching numbers of them, which yield an abundant supply of food for winter store; so it seems beyond question that this species is quite at home in the beginning of the arctic winter in that region, and the immense numbers of Bowheads and Right whales that would necessarily appear in the temperate latitudes if they migrated southward would be sure to arrest the attention of passing navigators, who frequently go far north, even in the winter season, to make their passages from China and Japan. Some have asserted that they probably congregate around the borders of the drifting or field ice, which joins the open water of the Pacific about the Kurile, and Aleutian Islands. All agree that they do not pass the tropics and reach the southern hemisphere. The southern Right Whales resort to the bays in that region to bring forth their young, and formerly were sought for in those inland waters, where many a ship has quickly completed her cargo by bay-whaling in high southern latitudes. But no bay has yet been discovered north of the equator in the Pacific where the North-West Right Whales go to calve; and, as before mentioned, nothing is definitely known of their winter resort. The last seen of them in high latitudes by whalemen is on their return from the Arctic Ocean, when they are found about St. Paul's Island, Behring's Sea, in the month of October, and those found then are usually very large. In the Okhotsk Sea the Right Whale is found toward the northern limits, in the early part of the season; later the ships cruise in the southern part, about the Kurile Islands.

For much of the information about the habits of the Right Whale, and for some of the measurements which have guided us in making our drawing, we are indebted to Capt. Poole, commanding the Bark N. S. Perkins, of San Francisco, and Capt. Baker, of Brig L. P. Foster, which sails from the same port, and Capt. J. M. Green, long known as an experienced whaling master.

The average length of this species may be calculated at sixty feet, the two sexes varying but little in size; average yield of oil 130 barrels, average thickness of blubber ten inches, which appears quite white; yield of bone about 1400 lbs. to a hundred barrels of oil.

The Right Whale is found singly, or in pairs; at times scattered about as far as the eye can reach from the mast head. The last of the season they are sometimes seen in large numbers, crowded together. These herds are called " gams," and they are regarded by experienced whalemen as an indication that the whales will soon leave the ground.

The general habit of this animal is to spout seven to nine times to a " rising," then turning flukes (elevating them six or eight feet out of the water) it goes down, and remains twelve to fifteen minutes. It is remarked, however, since they have been so generally pursued by whalemen, that their action in this respect has somewhat changed. When " gallied " by the close approach of a boat they have a trick of hollowing the back, which brings the blubber slack, preventing the harpoon from penetrating. Many whales have been " missed " by the boatsteerer's darting at this portion of the body. Having been chased every successive season for years, these animals have become very wild. and difficult to get near, especially in calm weather. The manner of propelling the boat at such times is by paddling, and when there is a breeze, by sailing, if practicable, using the oars only when it is not possible to use sails or paddles. Among Right Whalemen there is a difference of opinion about "going on to a whale,"* whether it is best to get out of or into its wake to avoid gallying it; and as regards safety, some prefer to have a good breeze, then, setting all practicable sail, run over the animal to leeward, at the same time that the harpoon is thrown. The whale, after being struck, often runs to windward, thrashing its flukes in every direction, and after going a short distance frequently stops, or "brings to," "sweeping," as it is said, from "eye to eye," and at the same time making a terrific noise through its spout holes, called bellowing; this sound is compared to that of a mammoth bull, and adds much to the excitement in its chase and capture; others will not stop until they are hamstrung, as it were, by "spading." The spading process is performed by hauling the boat near enough to cut the cords that connect the body and flukes, either on top or underneath, as the attitude of the fish may be; a large vein runs along the under side of the "small," terminating at the junction of the caudal fin, which, if cut, will give the animal its death wound. The instrument used for cutting is called a boat spade, which may be compared to a very wide chisel, with a handle six or eight feet long; sometimes the cords are so effectually severed that the flukes become entirely useless, and still the animal slackens its speed hardly perceptibly, showing evidently that its pectorals are its principal propellers. Another mode of stopping them is by throwing a number of harpoons (detached from the line) into its small, a kind of torture that would seem, if the bleeding victim could speak, it would entreat its tormenters to put an end to its misery. But when once "brought to" it will remain nearly stationary for a few minutes or roll from side to side, giving the officer of the boat a good opportunity to shoot a bomb-lance, or use the hand lance with good effect, which soon dispatches it. But sometimes one of these huge animals. in spite of bomb guns, harpoons, and all the whaling craft combined, will, after being fastened to, make the best of its way to windward with the boat, taking it so far from the ship as to oblige the men to cut the line and give up the chase. Of late Greener's gun has been used to some extent in its capture. But before harpoon or bomb guns came into general use, the whaleman of the North-West coast made such havoc among these marine animals (which were regarded the most gigantic and vicious of their kind,) as to have nearly annihilated them or have driven them to some unknown feeding ground.

III. THE CALIFORNIA GREY WHALE.

RHACHIANECTES GLAUCUS Cope.

Agaphelus glaucus Cope, Pr. A. N. Sci. Phil. 1868, 225.

The California Gray is unlike other species of Balæna in its color, being of a mottled gray; some individuals, however, of both male and female, are nearly black. The jaw is curved downward from near the spoutholes to the "nib end," or snout, and is not so wide as that of the other species in proportion to the size of body. The length of the female is from forty to forty-four feet,† the fully grown varying but little in size; its greatest circumference twenty-eight to thirty feet, its "flukes" thirty inches in depth and ten feet broad. It has no dorsal fin. Its pectorals are six and a half feet in length and two and a half feet in width, tapering from near the middle toward the end, which is quite pointed.‡ It has a succession of ridges, crosswise along the back, from opposite the vent to the flukes.

The coating of fat, or blubber, is six to ten inches in thickness, and of a reddish cast. The average yield of oil of the female is forty barrels. The whalebone, or "baleen," of which the longest is fourteen to sixteen inches, is of a light brown color, the grain very coarse; the hair or fringe on the bone, likewise, is much coarser and not so even as that of the Right Whale or Humpback.

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*"Going on to a whale," is a whaleman's term for getting near enough to dart the harpoon.

† Forty-four feet, however, would be regarded as large, although some individuals have been taken that were much larger, and yielding sixty or seventy barrels of oil.

‡ The size of flukes and fins usually varies but little in proportion to the whale; the side view illustration is to represent the largest extreme of those parts of the animal.

The male may average thirty-five feet in length, but varies more in size than the female, and the average quantity of oil it produces may be reckoned at twenty-five barrels.

The California Grey is only found in north latitude, and its migrations have never been known to extend lower than 20° north. It fequents the coast of California from November to May. During these months the "cows" enter the lagoons on the lower coast to calve, having one young at a birth;* while the males remain outside, along the sea shore. Occasionally a male is seen in the lagoons with the cows the last of the season, and soon after both male and female, with their young, will be seen working their way northward, following the shore so near that they often pass through the kelp near the beach. It is seldom they are seen far from land.

Their habits are strikingly different from those of other species of Balæna, in resorting to shoal bays and lagoons to bring forth their young. In summer they congregate in the Arctic Ocean and Okhotsk Sea. It has been said that this species of whale is found on the coast of China, but this report needs confirmation. In October and November they appear off the coast of Oregon and Upper California, on their way back to their tropical haunts, making a quick, low spout at long intervals, showing themselves but little till they reach the smooth lagoons of the lower coast, where, if not disturbed, they congregate in large numbers, passing into and out of the estuary. or slowly raising their massive forms midway out of their element and falling over on their sides, dashing the water into foam and spray about them. At times in calm weather they are seen lying on the water quite motionless, keeping one position for an hour or more.

The first time we were in Scammon's Lagoons the boats were lowered several times for them, we thinking that the whales when in that position were dead or sleeping, but before the boat approached within darting or even shooting distance they were on the move again.

About the bar and shoals at the mouth of one of the lagoons, in 1860, we saw large numbers of California Grays; it was at the low stage of the tide, and the shoal places were plainly marked by the constantly foaming breakers. To our surprise, we saw numbers of these "Grays" going through the surf where there could barely have been depth to float them. We could see in many places, by the white sand coming to the surface, that they must be near to or touching the bottom. One in particular lay for a half hour in the breakers playing, as we have often seen seals in a heavy surf, turning from side to side with half extended fins, and moved apparently by the heavy ground swell which was breaking, at times making a playful spring with its bending flukes, throwing its body clear of the water, coming down with a heavy splash, then making two or three spouts, then settling under water, and perhaps the next moment his head would appear, and with the heavy swell the animal would roll over in a listless manner, to all appearance enjoying the sport intensely. We passed close to this playful fellow, and had only thirteen feet of water.

Hunt, Chase, and Capture—Dangers of Lagoon Whaling.

As the season approached for the whales to bring forth their young, which is from December to March, they formerly collected at the most remote extremities of the lagoons, huddled together so thickly that it was difficult for a boat to cross the waters without coming in contact with them accidentally. Frequent instances have been known of their getting aground, and lying for three or four hours with but two or three feet of water around them, without apparent inconvenience or injury from lying heavily on the sandy bottom till the rising tide floated them again.

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* Two or three calves have been seen with one whale, but these instances have only occurred in lagoons where there had been great slaughter among the cows, leaving their offspring motherless, which straggle about, sometimes following other whales, or congregating by themselves, a half a dozen together at times. We know of one instance when a whale was killed close to the ship which had a calf perhaps a month old. When the mother was taken to the ship to be cut in, the young one followed, and remained playing about for two weeks, but whether it lived to come to maturity is a matter of conjecture.

In February, 1856, we found two aground in Magdalena Bay. Each had a calf playing about; there being sufficient depth for the young ones, while the mothers lay hard on the bottom.

When attacked the smaller of the two old ones laid motionless, and the boat approached near enough to "set" the hand lance into her "life," dispatching her at a single dart. The other, however, when approached would raise head and flukes above the water, supporting herself on a small portion of the belly, turning easily, and heading towards the boat, which made it very difficult to capture her. It appears to be their nature to get into as shallow water as will float them when their calves are young. For this reason, the whaling vessels anchor a considerable distance, sometimes two or three miles, from where the crews go to hunt them. Several vessels are often in the same lagoons. The first streak of dawn is the signal for lowering the boats, all pulling for the head waters, where the whales with their calves are found. As soon as one is seen, the officer who first discovers it sets a waif in his boat, heads for the whale, and gives chase. Boats belonging to other vessels do not interfere, but go on in search of more whales. When the boats are in chase, great care is taken to keep behind and a short distance from the whale, till driven near the head of the lagoon or into shallow water; *then* the men in the boats nearest spring to their oars in the exciting pursuit. At such times the animal swims so close to the bottom as to impede its progress, thereby giving the boat a decided advantage; but occasionally the whale will suddenly change its course, or dodge, especially if she has a calf that is old enough to swim fast. Under such circumstances the chase will frequently last for hours, the boats cutting through the water at their utmost speed. At other times, when the calf is young and weak, the movement of the mother is very slow, keeping close to her young and giving it all the protection and assistance which her nature affords. It is an unusual occurrence for the mother to forsake her offspring when molested. When within "darting distance" (sixteen or eighteen feet), the boat steerer darts the "irons," and when the whale is struck it dashes about, lashing the water into foam, frequently even staving the boats. As soon as the boat is "fast" the officer goes into the head,* and watches a favorable opportunity to shoot a bomb lance into it. If it enters a vital part and explodes, it kills instantly, but it is not often this good luck occurs; oftener two or three bombs are shot which paralyze the animal to some extent, then the boat is hauled near enough to use the hand lance. After repeated thrusts the whale becomes sluggish in its motions; then, going "close to," the lance is set into its "life," which completes the capture; the whale rolling over on its side, with fins extended, dies without a struggle, or will circle around in a small compass, or make a zigzag course, heaving its head and flukes above the water, and either roll over, fin out, or die under water and sink to the bottom.

My remarks thus far have been confined principally to the females as they are found in the lagoons. Mention has been made, however, of the general habit of both male and female, in making their passage between their northern and southern feeding grounds, *of keeping near the shore.* This fact becoming generally known, and the bomb gun* coming into general use, has changed the mode of capture along the coast.

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* Whalemen call the forward part of a whaleboat the head, differing from merchantmen, who term it the bow; still the oar next to the forward one in a whaleboat is named the bow-oar; likewise when the boat is hauled close to the whale by heaving the line out of the "bow-chocks," and taking it to one side against a cleat placed a few feet aft of the extreme bow, it is called "bowing on."

Parties of whalemen have for several years established themselves along the shore at the most favorable points where the thickest beds of kelp are found, and there lay in wait watching for a good chance to shoot the animals as they migrate to their southern breeding grounds and return again to the north. This by whalemen is called "kelp-whaling." The first year or two that this kind of whaling was pursued, many of them passed through or along the edge of the kelp, giving the gunners an opportunity to choose their own distance for a shot. This manner of capture, however, soon developed the sagacity of these periodical visitors. At first the ordinary whale boat was used, but the keen-eyed devil-fish soon found what would be the consequence of getting too near the long dark-looking object, as it lay nearly motionless in the kelp, only rising and falling with the rolling swell.

A very small boat, with one man to shoot and another to scull, was then used instead of the whale boat and crew; this proved successful for a time, but as season after season passed the whales worked more off shore, and at the present time the boats anchor a little outside the kelp as a general rule. The whale being seen approaching at a distance far enough for the experienced gunner to judge pretty nearly where the animal will "break water," near to this place the boat is sculled to await the "rising." If the whale "shows a good chance," it is frequently killed instantly and sinks to the bottom, or receives its death-wound by the bursting of the bomb-lance. Consequently the stationary position or slow movement of the animal enables the whaler to get a harpoon into it before sinking. To the harpoon a line is attached, with a buoy at the end, which indicates the place where it lies on the bottom. Usually in the course of twenty-four hours, and often in much less time, the whale rises to the surface, and is then towed to the shore, the blubber taken off, and tried out in pots set for that purpose on the beach.

Another mode of capture along the coast is by the ships cruising a little way off shore, sending the boats inshore, towards the line of kelp, and as the whales pass to the southward, the boats being provided with extra large sails and the whalemen taking advantage of the strong northerly winds which prevail, run their boats before the wind, sailing near enough to dart the ordinary hand harpoon into the animal, getting fast this way. The whale is killed in deep water, and if inclined to sink, it can usually be held up by two boats, till the ship comes to them, when a large "fluke-rope" is made fast or the "fin-chain" is fastened on its fins, the "cutting tackle" hooked, and the whale "cut in" immediately. This manner of taking the whale is called "sailing them down."

Still another way of catching them is with Gruner's Harpoon Gun, which is similar to a small swivel gun. It is of one and a half inch bore, and three feet long in the barrel, and when stocked and complete weighs seventy-five pounds. The harpoon, four feet and a half long, is projected with considerable accuracy to any distance under eighty-four yards. It is mounted on the bow of the boat, and was formerly fired by the boat steerer who pulls the harpooner's oar. This was the old Scotch plan, the gun being first used by the Scotch whalers; but at the present time it has been more successfully managed by the officer in charge of the boat, who takes the boat steerer's place for the time. A variety of manœuvres are practised with the boat when using the harpoon gun; at times lying at anchor as in deep whaling, at other times drifting about for a chance shot, or paddling quietly if in calm weather, and when a breeze comes sailing after the animal. When the whale is judged to be ten fathoms off, the gunner sights eighteen inches below its back; if fifteen fathoms, eight or ten inches below; if eighteen or twenty fathoms distant the gun is pointed at the top of the back. Twenty fathoms is considered a long range, as there is constantly more or less motion to the boat.

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* The bomb gun is made of iron, stock and all. It is three feet long, the barrel of which is twenty-three inches in length; diameter of bore, one and one-eighth of an inch; weight, twenty-four pounds. It shoots a bomb lance twenty-one and a half inches long, and of a size to fit the bore. It is pointed at the end, with sharpened edges, in order to cut its way through the fibrous fat and flesh, and is guided by three elastic feathers, which are attached along the fuse tube, folding around it when in the barrel. The gun is fired from the shoulder, in the same way as a musket.

Gruner's gun, as a general thing, has not been brought into successful use among American whalemen, except for this peculiar species of whale, along this coast, where much of the time the water is quite smooth—during the winter months. It has been used of late with great success, the harpoon being so effective a weapon as often to give the whale a death-wound, and in some instances killing instantly.

Still another strategic plan has been practised with successful results, called "whaling along the breakers." Mention has been made of one prominent habit of these periodical visitors to the coast, evidently taking great delight in playing their uncouth gambols through or along the breakers that front the mouths of the lagoons. This the watchful eye of the whaler was quick to see could be turned to his advantage and to the destruction of this interesting marine animal, when exhibiting its natural habits. They will pass through the surf where there is scarcely water to float them, and frequently are seen along the edge of the breakers, and in making their passage north and south they follow along the outlying shoals as they once did along the kelp.

After years of pursuit by waylaying them around the beds of kelp, the wary animals learned to shun those points of death, and seemingly made a wide deviation in their course to enjoy the sport among the rollers of the lagoons' mouths, as they passed them either way. But the civilized whaler, their greatest enemy, ever ready to destroy for gain, anchors his boats as near the roaring surf as safety will permit, and the unwary "fish" that comes in reach of the deadly harpoon, or bomb, is very sure to pay the penalty with its life. If the whale comes within darting distance, he is harpooned, and as they almost invariably run "off shore" they are soon in clear deep water, where the pursuer makes his capture with comparative ease; or, if passing within range of the bomb gun, one of the explosive missiles is planted into its side. This usually so paralyzes the animal that the first boat's crew, who have been resting at anchor, taking to their oars, soon overtakes the wounded animal, which is fastened to and despatched in a summary manner.

The casualties occurring in connection with the coast and kelp whaling are nothing to be compared with the accidents that have been experienced by those engaged in taking them in the lagoons. Hardly a day passes but that there is upsetting or staving of boats, the crews receiving bruises, cuts, and in many instances having limbs broken, and repeated accidents have happened where men have been instantly killed or received mortal injury. The reasons of the increased dangers in lagoon-whaling are, first, the sandy bottom being continually stirred by the strong currents mixing with the water, making it difficult to see an object to any considerable depth; the quick and deviating movements of the animal, and its unusual sagacity. When a whale is struck at sea there is generally but little difficulty in keeping clear. When it is first irritated by the wound of the harpoon, it endeavors to escape by "running," or descends to the depths below, taking out more or less line in its course, the direction of which and the movements of the boat indicate the whereabouts of the animal. The clear water likewise renders an object visible a considerable distance below the surface, so that in any event the careful "boat-header" has comparatively but little difficulty in keeping clear of the whale when first struck.

But in a lagoon the object of pursuit is in narrow passages, where frequently there is a swift tide, and the turbid water precludes seeing far beneath the boat. Should the chase happen to be made *with* the current, if the whale is struck, it often stops suddenly, and the speed of the boat, together with the influence of the running water, prevents it from being kept clear, notwithstanding the utmost caution and exertion to avoid accident, the boat shooting against or over the animal, when it is dashing the water in every direction. The whales that are given chase to have a calf with them, and the mother, in her endeavors to avoid the pursuit of herself and offspring, will sometimes lose sight of her calf in the thick water. Instantly she stops, "sweeping" around in search of the lost one, and at such times if the boat comes in contact with her, it is almost certain to be stove. Another great danger is in killing the calf. At times, when the harpoon is thrown or the lance darted at the mother, the calf, in its innocent gambols about the parent animal, will get in the way of the weapon, and receive the wound, killing it instead of the intended victim. In such cases the whale in her frenzy will chase the boats, and overtaking them will overturn them with her head or dash them in pieces with a stroke of her flukes. Sometimes the calf is fastened to instead of the cow. In such instances the mother may have been an old frequenter of the "ground," and before chased perhaps suffered from attack, consequently is more difficult to capture, staving the boats and escaping after repeatedly receiving wounds. One instance occurred in Magdalena Lagoon, in 1857, where, after several boats were stove, they being near the beach, the men in those remaining afloat managed to pick up their swimming comrades and in the meantime to run the line to the shore, hauling the calf into as shallow water as would float the "dam," she keeping near her troubled young one, giving the gunner a good chance for a shot with his bomb-gun from the beach. A similar instance occurred in Scammon's Lagoon in 1859.

The testimony of many officers of whaling vessels furnishes abundant proof that this species of whale is possessed of unusual sagacity, and their inordinate affection for their offspring is beyond question. Numerous contests with them prove that after the loss of their young the enraged animal has given chase to the boats, which only found security by pulling into shoal water or to shore. The many mishaps that have been experienced among a class of men that are fond of listening to tales of adventure or relating their own exploits have been the sources from which many a marvellous though truthful tale has sprung.

Indian Whalemen of the North-West Coast.—Indian Whaling Canoe—.Indian Whaling Craft—Indian Whaling.—Disposition of the Whale after Captured.—Description of the Eskemo Whaleboat.—Eskemo Whaling Implements.—Division of the Captured Whale.—Closing Remarks.

After evading the civilized whaler and his instrnments of destruction, or suffering from wounds received while in their southern haunts, these migratory animals of both sexes begin their northern journey.

The mother with her young, grown to half the size of maturity, but wanting in strength, make the best of their way along the shores, avoiding the rough sea by passing between or near the rocky islets which stud the points and capes. But scarcely have they quitted their southern homes before they are surprised by the Indians about the Strait of Juan De Fuca, Vancouver's and Queen Charlotte's Island. Like enemies in ambush, they glide in canoes from island, bluff, or bay, rushing upon them with whoop and yell, launching their instruments of torture into them, like hounds worrying the last life-blood from their vitals, and then trains of canoes tow the captured ones to shore in triumph. The whalemen among the Indians of the north-west coast are those fond of the height of adventure, and likewise of becoming worthy of the greatest consideration among their fellows. The one among them that could boast of killing a whale formerly had the most exalted mark of honor conferred upon him by a cut across his nose.*

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* This custom is no longer practiced.

The whaling canoe is from thirty to thirty-five feet long; eight men invariably make the crew, each wielding a paddle five and a half feet long. The whaling craft consists of harpoons, lances, lines, and sealskin buoys, all of their own workmanship.

The harpoon is much the shape of the head of the common lance used by our whalers, adding two pieces of pointed bone projecting from one of the edged sides of the weapon. Its length is six and a half inches and its width two and a half inches. It is composed of sheet iron, bone, the fibers of cedar roots, or of the wild nettle, and gum. The iron forms the *principal* and cutting part, and is perforated from midway to the end that joins the line. "Formerly the muscle-shell was used to make this blade." The horns of bone which extend from one edged side as before mentioned, are placed one on each flat side of the iron; the rope unlaid and marled on with the pieces of bone, through the holes in the sheet iron blade, and the whole covered with a coating of gum. The rope, bones, and seizings, form a cavity, into which the pointed end of the harpoon pole or staff is inserted. This pole—made of yew—is eighteen feet long and weighs about nineteen pounds. It serves the double purpose of harpoon-staff and lance-pole.

The lance is of the same shape as the harpoon, without the barbs or horns, and adding the socket for the lance-pole. The blade is made of a muscle-shell, and the socket is formed of cedar bark "woulded" or "served" with fibrous roots, the whole gummed in like manner as the harpoon. Its length is seven inches, and it is two and a half inches wide.

The line is made of cedar withes, twisted into a three-strand rope five-eighths of an inch in diameter, and looking very much like coir rope; the usual length of the line is fifty to sixty feet for the first harpoon, but the buoys attached to the harpoons subsequently thrown have only about five feet of line.

The buoys are prepared seal skins with flipper holes and mouth secured air tight; one flipper hole is fitted with a nozzle, for the purpose of blowing it up when required for use. These buoys are fancifully painted, according to the taste of the owner of the canoe to which they may belong, care being taken that each canoe's buoys are differently marked.

Their whaling grounds are limited, as the Indian whalers rarely venture seaward far out of sight of the smoke from their habitations by day, or beyond view of their bonfires at night.

The number of canoes engaged in the chase is from two to five, each one of the crew being from among the chosen men of the tribe, who can with silent stroke paddle the sharp, symmetrical cauim* close to the rippling water along the sides of the animal. The bowman then, with sure aim, thrusts the harpoon into it, and heaves the line and buoys clear of the canoe. The whale diving deeply, sometimes takes the buoys out of sight, but from the long stretch of line, and the pursuit being usually near the coast, on comparatively shoal soundings, there is but little time when the inflated seal-skins do not indicate the animal's whereabouts. The instant they are seen by the nearest canoe a buoy is elevated on a pole, and all dash with shout and *grunt* toward the object of pursuit. The chase then becomes one of great excitement, each boat being provided with implements alike; in order to entitle it to a full share of the prize when captured, its crew must get their harpoon into the animal with the buoys attached to the line. After the whale is struck, the strife that ensues to be the next to launch the prize-weapon, creates a scene of brawl and agility peculiar to these piscatory adventures. One canoe after another approaches, and its bowman hurls his missile deep into the side of the huge animal. At length the victim, becoming weakened by loss of blood and strength, slackens its speed. The canoe is then carefully paddled near, and the lance is used with unerring precision

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* Cauim is the name for canoe among these tribes.

—the rude weapon being cautiously handled to prevent accident to the craft by contact with the dashing flukes and fins of the whale. This careful manœuvring subjects the bleeding animal to a system of torture characteristic of the savage horde about it, and eventually, bleeding its last blood from a lacerated heart, it writhes in convulsions and expires. Immediately after the whale is dead, the whole fleet of canoes assist in towing it to the shore. As soon as the prize is brought to the beach a division is made, and all the inhabitants of the village gorge themselves upon its fat and flesh till their greedy appetites are satisfied. After the feast, what oil can be extracted from the remaining blubber is put in skins or bladders, and becomes an article of traffic with neighboring tribes, or the white traders that frequently visit them.

This *whale of passage*, when arrived among the scattered floes of the Arctic Ocean, is rarely pursued by the whaleship's boats, consequently they rest in some degree of security; but even there, when a favorable opportunity offers, the watchful Eskemos steal upon them and with their rude weapons and torturing process, the whale pursued, at last yields to the combined enemies about it, and supplies food and substance for its captors.

The Eskemo whaling boat, although to all appearances simple in its construction, will be found, after careful investigation, to be admirably adapted to the purpose, as well as for all other uses necessity demands. It is not only used to accomplish this the most important undertaking within their frozen imaginations, but in it they pursue the walrus, shoot game, and make their long summer voyage about the coast, up the deep bays and long rivers, for the purpose of traffic with coast and interior tribes.

When they prepare for whaling, the boat is cleared of all passengers and their effects, nothing being allowed in it but the whaling implements and boat gear. Eight picked men make the crew.* Their boats are twenty-five to thirty feet in length, flat on the bottom, with flaring sides and tapering ends; there are four thwarts which are placed about midway between the bottom and the gunwales. The frame is of wood, and consists of fourteen or sixteen ribs, a center-piece along the bottom, stern and bow timbers and strips run along each side to receive the thwarts and give shape to the craft. The frame is lashed or served together, with the fibres of whalebone and thongs of walrus' hide, the latter article being the covering or planking to the boat.

The whaling implements are one or more harpoons of their own make, four seal-skin buoys, a line made of walrus hide, one end of which is fastened to the harpoon, the other to one of the buoys, a boat mast that serves the triple purpose of spreading the sail, and furnishing the staff for harpoon and lance, a large knife or two, and eight paddles.

The harpoon is made out of the walrus tusk, with a piece of stone or iron fitted in the end for a point; it is nine inches long, three-fourths of an inch in average thickness; width one inch and three-eighths, tapering a little towards the pointed end. The socket end is of a diagonal shape, the better to catch the flesh; in the middle or nearer the socket end, a hole is made to receive the strap of walrus hide to which the line is fastened. The point end has a triangular-shaped piece of thin iron or stone inserted in it—as before mentioned—which completes the weapon. In the socket end of this harpoon the small end of the boat mast is fitted, and serves as the harpoon staff. A common butcher knife, the blade fourteen or sixteen inches long—which they purchase from whale ships or trading vessels—lashed to the boat mast constitutes the lance.

The boat being in readiness the chase begins. As soon as the whale is seen and its course ascertained, all get behind it; not a word is spoken, nor will they take notice of a passing ship or boat, when once excited in the chase.

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* It is said by Capt. Norton, who commanded the ship "Citizen," wrecked in the Arctic several years since, that the women engage in the chase.

All is silent and motionless till the whale spouts, when with instant dash all paddle towards it. The moment the spouting is over, every paddle is raised from the water. Again the spout is seen, or in thick weather *heard* through the fog—again they spring to their paddles. In this manner the animal is approached near enough to dart the harpoon, when all shout at the top of their voices and make all the noise possible. This is said to have the effect of checking the animal's progress, till the harpoon is planted in its body with line and buoy attached. The chase is continued in like manner until a number of weapons are fastened, causing the whale much effort to get under water and still more to remain down; consequently it soon rises again, and is attacked with renewed vigor. In a short time it becomes so much exhausted that the boat can, without much risk, go close to it. It is an acknowledged right with them for the man that first harpoons the whale to take command of the whale party. Accordingly, as soon as the proper time arrives his "baidarra" is paddled close to the whale, and with surprising quickness he cuts a piece of blubber from its side large enough to admit a knife and the boat mast to which it is lashed. Then the cutting and piercing begins, and is continued till the whale is in his death struggles. The capture being made and the whale towed to the shore, it is divided as follows: Each member of the party receives ten slabs of bone, and a like proportion of the blubber and entrails; the owners of the canoes take the remainder.

The choice pieces for a dainty repast with them are the flukes, lips and fins. The oil is a great article of trade with the interior tribes of reindeer men; it is sold in skins, containing about fifteen gallons each, a skin of oil being the price of a reindeer. The entrails are made into a kind of sauce by pickling them in a liquid extracted from a root that imparts an acrid taste. The preparation is a savory dish among them as well as a preventative of the scurvey. The lean flesh of the whale supplies food for their dogs, the whole canine horde of the village assembling where the carcass lies, fighting, feasting, growling and howling, as only Eskemo dogs can.

Many of the prominent habits of the California Gray are widely different from those of other species of *Balæna.* It makes its regular migrations from the hot southern latitudes to beyond the Arctic circle, and in these passages between the antipodes of climate it follows the general trund of an irregular coast so near that it is exposed to attack from the savage tribes inhabiting the sea-shores, who pass much of their time in the canoe, and make the capture of this piebald animal a feat of the highest distinction. As it approaches the genial waters of the torrid zone it presents an opportunity to the civilized whalemen, at sea, along the shore, and in the lagoons, to practice their different modes of strategy, that hasten its annihiliation. It manifests inordinate affection for its young and seeks the quiet waters of the *estuaries* lying under a tropical sun, as if to warm its offspring into activity and promote comfort in their native element until grown to the degree that nature demands for their first northern visit. When the parent animals are attacked they show a degree of resistance and tenacity of life that distinguish them from all others of the great cetacean family.

Many expert whalemen have been made to suffer in the encounter, and, as before mentioned, there is no lack of instances where the daring pursuer has either been killed or received serious injury. Once captured, however, they yield the coveted reward to their enemies. They furnish sustenance for the *Eskemo* whaler from such parts of the animal as are of little value to others. The oil extracted from their fatty covering is exchanged with remote tribes of *reindeer men* for their fur clad animals, of which the flesh affords the venders a feast of the choicest food, and the skins form an indispensable article of clothing. The North-West Indians realize the same comparative benefit from the captured animals as do the Eskemo, and look forward to its periodical passage through their circumscribed whaling grounds as a season of exploits and profit.

The civilized whaler seeks the hunted animal farther seaward, as from year to year it learns to shun the fatal shore. No species of the whale tribe is so constantly and variously pursued as the one we have endeavored to describe, and the large bays and lagoons where once these animals congregated, brought forth and nurtured their young, are now nearly deserted. Their mammoth bones lie bleaching on the shores of those placid waters, and are strewn along the broken coasts from Eastern Siberia to the Gulf of California. Ere long the California Gray will be known only as one of the extinct species of Cetacea recorded in history.

IV. THE HUMPBACK.

MEGAPTERA VERSABILIS Cope.

Description of the Animal—Measurements—Vermin Infesting Whales—Barnacles—Time of Bringing Forth the Young—How Captured—Favorite Feeding Grounds on the Coast

The Humpback is one of the species of Whale that roam through every ocean, generally preferring to feed and play its uncouth gambols near extensive coasts, or about the shores of islands, in all latitudes except the frozen polar regions.

It is irregular in its movements, seldom going a straight course for any considerable distance ; at one time moving about in large numbers, scattered over the sea as far as the eye can discern from the masthead, at other times *singly*, seeming as much at home as if it were surrounded by hundreds of its kind ; at will performing the varied actions of breaching, rolling, fining, loptailing, or scooping ; or, if a calm sunny day, perhaps lying motionless on the molten-looking surface, as if life were extinct.

Its shape, compared with the symmetrical forms of the Finback, California Grey, or Sulphurbottom, is decidedly ugly, a short body with immense belly, and frequently diminutive "small," inordinately large pectorals and flukes. A protuberance, of variable shape and size in different individuals, placed on the back about one-fourth the length from the flukes, is called the hump. All combined impress the observer with the idea of abnormal proportions. The top of its head is dotted with irregular rounded bunches, that project above the surface about a half inch, each covering about two inches of space.

The following measurements and memoranda were taken by Capt. F. S. Redfield, of the whaling and trading brig "Manuella," while cruising in Behring Sea, September 17th, 1866:

	Ft.	In.
Extreme length	49	7
Length of pectorals	13	7
Breadth "	3	2
Distance from snout to pectorals	12	0
" " corner of mouth to snout	12	0
" " eye to snout	12	6
" " spoutholes to snout	10	0
Breadth of flukes	15	7
Depth "	3	4
Distance from arms to flukes	11	6
" " genital slit	17	0
Length of folds on belly	16	0
Whole breadth of folds on belly	10	0
Distance from flukes to hump	12	3
Length of hump along the back	3	0
Height of hump	1	0
Depth of small close to flukes	2	6
Thickness of small close to flukes	1	6

Number of folds on the belly twenty-six, averaging in width from four to eight inches. Thickness of blubber five to ten inches. Color a yellowish white. Yield of oil forty barrels.*

Color of body black, under side of pectorals white. Frequently the under side of the flukes is white likewise, and sometimes the greater portion of the belly. The Humpback, as well as all other whales except the Bowhead or Arctic whale, are infested with parasitic crustaceans, which collect about the head, particularly near the spoutholes, and if there are any scars or sores on the animal's body, this vermin is sure to find them.† They vary from as small as can be discerned with the naked eye to one inch in length, and are of a straw color, furnished with numerous legs, disposed in a row on each side of the body, and a mouth that at least gives a sharp bite to human flesh.

The Humpback has also growing on its body what are termed barnacles, which appear to collect most on the fins, flukes, and head. This barnacle is entirely different from that found on a vessel's bottom, timber, rocks, &c., being flat on the side that adheres to the skin, the edges forming a circle, the mouth or opening being in the centre and protected by a rounded, bony or flinty substance, the exterior of which is creased into a rough surface, and in color nearly white, or mottled with black. The size of the barnacle varies from half an inch to two and a half in diameter, and from one-fourth to three-fourths of an inch in thickness.

The peculiar undulating movement of the Humpback, its frequent roundings, turning flukes, and irregular course, are characteristic habits that the quick and practised eye of the whaler can distinguish at a long distance. Like all other whales it has two spoutholes, and when it respires, the breath and vapor ejected through these apertures forms the "spout," which rises in two separate columns, joining in one as it ascends and expands. When its enormous lungs are brought into full force the spout rises twenty feet or more. When the whale is going to windward the influence of the breeze upon the vapor is such that a low "bushy" spout is all that can be seen. The number of "spoutings to a rising" is exceedingly varied, sometimes blowing only once, at another six, eight or ten, and from that up to fifteen or twenty times.

From observations made along the coasts of the North and South Pacific in regard to their times and places of resort for the purpose of bringing forth their young, we deduce the following:

In the year 1852—3 large numbers of Humpbacks resorted to the Gulf of Guayaquil, coast of Peru, to calve, and the height of the season was during the months of July and August. The same may be said of the gulfs and bays situated near the corresponding latitudes north of the equator; still, instances are not unfrequent when a cow with her young one is seen at all other seasons of the year about the same coast. In the Bay of Valle de Banderas, coast of Mexico, latitude 20° 30′, in the month of December, we saw numbers of Humpbacks with calves but a few days old. In May, 1855, at Magdalena Bay, coast of Lower California, about lat. 24° 30′, we found them in like numbers, and with very large calves.

Our belief is that the females of this species may resort in large numbers to favorite inland waters, connected with the ocean, to bring forth their young; but there are many exceptions to this rule, and on account of their roving habit they are found on different coasts in all latitudes between the freezing points, from the young one but a few days old to those of extreme maturity.

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* The Humpback probably varies more in size and yield of oil than any others of the whale family; we having frequently taken those that made but eight or ten barrels, and from that up to seventy-five. Their length would vary from twenty-five to sixty-five feet. We have reliable account of one being taken in Monterey Bay, in 1858, which produced one hundred and forty-five barrels of oil.

† On the coast, in 1856, we took a whale that had many patches of vermin upon his body, several of them three or four feet in extent. It proved to be what is called a "dry skin," the blubber yielding no oil; and the lean condition of the animal was attributed to the unusual number of those troublesome creatures upon it.

They are captured with the common hand harpoon and lance, adding the use of the bomb-gun, and as they are very liable to sink when dead, every exertion is made to get the harpoons in before the gun is discharged. The best points for Humpback whaling on the coast have been Magdalena, Ballenas, and Monterey Bays.

V. THE SULPHURBOTTOM.

SIBBALDIUS SULFUREUS Cope.

The largest whale found upon the coast, if not the largest known, is the Sulphurbottom.

Never having had an opportunity of obtaining an accurate measurement of its proportions, I can only state them approximately.

Length seventy to ninety feet; the body is comparatively more slender than the California Gray; the pectorals and caudal fin may be regarded as being in like proportion to the body as those of the Finback and the "Gray." The color is somewhat lighter than in the former on its back and sides, but underneath it is of a yellowish cast, or sulphur color: hence the name Sulphurbottom is supposed to have been given. The dorsal fin is much smaller than that of the Finback, and is a little nearer the flukes, but the head, throat and bone in shape is similar to that species.

A Sulphurbottom is found in the Atlantic as well as in the Pacific. The Pacific species occurs at all seasons on the coasts of the Californias. During the months from May to September they are often found in large numbers close in with the shore, at times playing about ships at anchor in the open roadsteads, near islands or capes, but as a general rule they do not approach vessels with the degree of boldness that the Finback does.

The Sulphurbottom is considered the swiftest whale afloat, and for this reason is but seldom pursued and still more rarely taken. Capt. Thomas, of the bark Lagrange, in 1857, off St. Bartolme Bay, caught one by first shooting a bomb-lance into a vital part; and, although the whale ran a long distance before "turning up," they were enabled to keep trace of it among the large number around by its spouting blood. When the animal was nearly exhausted, the boats approached near enough to get fast, which was done and the capture completed. This one yielded about ninety barrels of oil, and measured eighty-five feet in length. The schooner "Page," of San Francisco, succeeded in taking several near Ascension Island, the vessel laying at anchor under the lee of it, the capture being made with the bomb-gun and lance. Notwithstanding that a large proportion of these whales sank as soon as dead, they were enabled to save them, the water being of moderate depth, in consequence of which the whales rose to the surface before decomposition was far advanced. The size and yield of those taken by the "Page" compared favorably with the one taken by the "Lagrange."

Several days' trial was made in the brig "Boston," in 1858, off Cenos Island, to capture these animals. It was the month of July, and the sea, as far as the eye could discern, was marked with their huge forms and towering spouts. Ten were bombed by the best shooters, who affirmed that they chose their "chance," but as soon as the gun was discharged the whale would disappear, and that was the last trace seen of it, except a patch of foam, sometimes mixed with blood. On the last day of pursuit, toward the evening, another vessel appeared in the offing and approached within a mile or less, when the last trial bomb was fired and the men in the boats looked eagerly to the rising of the wounded whale, bnt in vain. A signal was made from the approaching ship that they had seen it, as it "broke water" close to the vessel, and it soon rolled over and sank. The swiftness of this animal, under water, as demonstrated at this time, appeared to make it impracticable to pursue them.

Doubtless several of those fired at received mortal wounds, or were killed outright, but their propensity to sink, and also to " run under water," baffled the skill of the whalers to secure them.

VI. THE FINBACK.

BALÆNOPTERA VELIFERA Cope.

Another species of the Whale tribe is known as the Finback.

One picked up by Capt. Poole, of the bark "Sarah Warren," of San Francisco, affords us the following memoranda: Length sixty-five feet. Thickness of blubber seven to nine inches. Yield of oil seventy-five barrels. Color of blubber a clear white. Top of head quite as flat and straight as that of the Humpback. Baleen, the longest two feet four inches, greatest width thirteen inches, its color a light lead streaked with black, and its surface presents a ridgy appearance crosswise; length of fringe to bone two to four inches, and in size this may be compared to a cambric needle.

Its side fins and flukes are in like proportion to the body as in the California Gray. Its throat and breast are marked with deep creases or folds, like the Humpback. Color of back and sides black or blackish-brown; belly a milky white. Its back fin is placed nearer to the caudal than the hump on the Humpback, and in shape approaches to a right-angled triangle, but rounded on the forward edge, curved on the opposite one, and the longest side joins the back in some individuals; in others the anterior edge is the longest.

The habits of the Finback in several points are peculiar. When it respires the breath passing through its spoutholes produces a sharp sound that is quite distinguishable from that of other whales of the same genus. It frequently gambols about vessels at sea, in mid ocean as well as close in with the coast, darting under them or shooting swiftly through the water on either side, at one moment upon the surface, belching forth its quick ringing spout, and the next instant submerged deep beneath the waves. In beginning the descent it assumes a variety of positions, sometimes rolling over nearly on its side, at other times rounding or perhaps heaving its flukes out and assuming nearly a perpendicular attitude. Frequently it remains on the surface, making a regular course and several uniform blows. Occasionally they congregate in schools of fifteen to twenty or less. In this situation we have usually observed them going quickly through the water, several spouting at the same instant. Their uncertain movements, however, often showing themselves twice or thrice, then disappearing, and their swiftness, make them very difficult to capture. The results of several attempts to catch them were as follows: One was shot from the ship with a bomb-gun, which did its work so effectually that, although the boat was in readiness for instant lowering, before it got within darting distance the animal, in its dying contortions, ran afoul of the ship, giving her a shock that was very sensibly felt by all on board, and likewise a momentary heel of about two streaks. We got quite a good look at the under side of the whale as it made several successive rolls before disappearing, and our observations agreed with those noted on board the "Sarah Warren" in relation to color of belly and the creases on throat and breast. The under side of fins was white also. At another time the whale died about ten fathoms under water, and after carefully hauling it up in sight, the "iron drawed and away the dead animal went to the depths beneath." Frequently we have "lowered" for single ones that were playing about the ship, but by the time the boats were in the water nothing more would be seen of them, or, if seen, they would be a long way off and then disappear.

An instance occurred in Monterey Bay, in 1865, of five being captured under the following circumstances: A "pod" of whales were seen in the offing, and the whalemen from their station on shore immediately embarked in their boats and gave chase. On coming up with them they were found to be Finbacks. One was harpooned, and, although it received a mortal wound, they all "run together" as before. One of the gunners, being an expert, managed to shoot the whole five, and they were all ultimately secured, yielding to the captors a merited prize. We have noticed more of these whales along the coast during the summer months, and they seem to be more together then; but, as the opportunities for observing their habits have been much greater at that season of the year, we may have been led into error in this particular point. On the northern coast the Finbacks, in many instances, have a much larger fin than those in warmer latitudes, and I am fully satisfied that these are a distinct species, confined to the northern waters.

We have had but little opportunity to observe the Finbacks that frequently rove about the Gulf of Georgia and Juan de Fuca Strait. Several have been seen, however, in May and June, on the coasts of California and Oregon, and in Fuca Strait in June and July of the present year; these observations satisfy me that the dorsal fin of this, the northern species referred to, is strikingly larger than in the more southern Finbacks.

Appended is a sketch of one individual of several seen in Queen Charlotte Sound in February, 1865, which is a fair representation of them all. Those I have noticed about Fuca Straits seem to have the back fin modified in size between the extremely small found on Lower California and the one here represented.

Further investigation, which I hope to have the opportunity of before very long, may settle this question.

VII. THE DOLPHIN FAMILY.

DELPHINIDÆ.

In addition to the Whales which have been described as frequenting the coast, many species of Cetacea of the Dolphin family are also found. Those coming under our observation are known as the Bottlenose, Grampus, Blackfish, Killer, Cowfish, Right-whale Porpoise, Finback or common Porpoise, and Bay Porpoise. All these species are covered with a coating of fat or blubber, varying in thickness from half an inch upwards, according to their size and degree of fatness.

THE BAY PORPOISE.

PHOCÆNA VOMERINA Gill.

Proceed. Acad. Nat. Sci. Phila. 1865, p. 178.

The habits of this animal differ from those of the other species found in the open sea or along the coast. Their home seems to be in the discolored waters between the limits of the pure ocean element and the fresh rivers. They are rarely seen on either side of these boundaries. Our observation proves that they are found as far south as the Valle de Banderas Bay, about the mouths of the river, Piginto, on the coast of Mexico, which is in lat. 20° 30′, and as far north as Columbia River, lat. 46° 16′. In the winter season they are seen off Astoria, and in Cathlamet Bay, twenty miles above; but during the spring and summer, when the river is fresh to its mouth, and in some instances for miles at sea, they leave the Columbia, following in the vein of mixed water. They are never found in schools, but occasionally six or eight may be seen scattered about, appearing on the surface alternately, singly or two or three at the same instant. They do not make those playful gambols and leaps that the other species do, their general habits being to make a quick turn as soon as appearing above water, apparently choosing the darkness below rather than the light above. It is not from shyness, however, for they are met with about roadsteads and harbors, among the shipping, and frequently play their odd turnings close about vessels under way or at their moorings. By night, when at anchor, we have known them to play about the vessel's rudder.

Sometimes they are seen among the breakers on the bars which front harbor mouths, darting through or along the crest of the rollers as if excited into unusual action by the dashing waves surrounding them.

They feed on small fish, and are occasionally taken in the seines that are hauled about the shores of San Francisco Bay by the Italian fishermen.

BOTTLENOSE GRAMPUS.

The Bottlenose Grampus is probably the largest of the species of Cetaceans reckoned among the Dolphin or Porpoise family. Its color approaches nearer to brown than black. The fin on the back is comparatively small, angular in shape, with the longest side attached to the body, and placed much nearer the caudal fin than on other species. The name Bottlenose is said to have been given it by reason of the head resembling the upper portion and neck of a junk-bottle; if so, from our observation of them (which was many times, from the vessel's deck or masthead) in their different natural positions, the bottle must have been one with a very large but exceedingly short neck; still the comparison is not inappropriate. The Grampus has habits such as nearly preclude capture, and but little is known about its peculiarities. They are generally seen two or three together, "rounding" to "go down" as soon as coming to the top of the water and spouting, and when rising to the surface the next time may be beyond view. It is said they have been taken with a line upward of three hundred fathoms long.

The largest of the species are not less than twenty-five feet long, and otherwise of similar proportions with the Blackfish. The head appears to be intermediate between that of the Blackfish and Porpoise, having a short snout, or round-pointed beak.

I met with a related species on the coast of Lower California, in July and August.

An exception to this, however, occurred on the coast in July and August, 1856, between Cape St. Lucas and Cerros Island, at which time we saw large numbers of them going in schools. ten, twenty or thirty together, nearly all being of the largest growth, and their actions were a good imitation of a school of small sperm whales—spouting several times up, and only remaining down the usual time of sperm whales of their apparent size. Several fruitless trials were made to capture one. In two instances the harpoon was fastened effectually, and the consequence was that the animal immediately dived down with great velocity, each taking a line in its descent one hundred and fifty fathoms long almost before the boats' crews knew what they were about.

In March, 1853, off Panama Bay, on board the bark Rio Grande, we captured what was supposed to be two small Blackfish, but on making an examination concluded that they were a species of Grampus.

Our notes are as follow: Length of largest one, 10 feet. Fin on back in same place as the Blackfish. Shape of fin—upper end more pointed, and the whole fin taking nearer the form of the dorsal fin of the common Porpoise. Body less in circumference in proportion to length than the Blackfish.

Form of head somewhat pointed, approaching to a beak. Color a uniform black. Average thickness of blubber about an inch, and quite red; the oil when extracted retained the same cast, and appeared watery.

The jaws were narrower at the base, more elongated, but furnished with teeth like those of the Blackfish.

FINBACK OR COMMON PORPOISE.

The Finback or common Porpoise is ordinarily — feet long, and its body of similar proportions with the Right-whale and Bay Porpoise. Its dorsal fin is longer and more pointed in proportion to its size than that of the Bay Porpoise. Its color on back and sides blackish-brown. Belly white or yellowish-white. We have observed this species to have a wider range, to congregate in larger numbers and exhibit more activity than others of the Dolphin family. They are seen in numbers varying from a dozen up to many hundreds, tumbling over the surface of the sea, or making arching leaps, plunging again on the same curve, or darting high and falling diagonally sidewise upon the water with a spiteful splash.

When a brisk breeze is blowing they frequently play about the bow of a ship going at her utmost speed, the animal cutting across the bow and shooting ahead, or circling around the vessel, apparently sporting at ease.

They are found in every ocean, and are often seen in considerable numbers about the large bays and lagoons along this coast, that have no fresh water running into them. They abound more along coasts where small fish are found than in mid ocean, as they prey upon the smaller finny tribes, and to obtain them shoot swiftly through the water, seizing the object of pursuit with the slightest effort. Occasionally a large school of them will get into a shoal of fish, frightening them so much that they will dart around in all directions, taking no regular course to escape their pursuers, and finally get so bewildered as to lose nearly all control over their movements. At such times the Porpoise is manifestly the "sea swine," filling itself to repletion.

In perfectly calm weather they are sometimes seen huddled together on the glaring surface, their heads slightly raised, or reclining a little on their sides, as if resting from their constant activity; but such instances are not frequent. Generally they are seen in large numbers rushing over and through the undulating sea, exhibiting their active habits and propensity to roam over an unlimited extent of ocean.

RIGHT-WHALE PORPOISE.

The Right-whale Porpoise in form and habit is nearly the same as the Finback, except it has no fin on its back, and is rather more slender in proportion to its length. They are not seen in as large numbers, and are seldom found in shallow bays and lagoons. We have met with animals of this genus from about Cape Horn as far north as Behring Sea, showing plainly that their feeding grounds embrace the whole coasts of North and South America on the Pacific side, if no more.

THE COW-FISH.

A species of Porpoise, larger than the Finback or Right-whale kind, is known under the name of Cow-fish. It is longer also in proportion to its greatest girth, but its head is not as long. Its teeth are larger, less in number, and it differs in its color, being of a dull black, lightened a little on the belly. This description is based upon two momentary observations—the first at St. Bartolme Bay, in 1853, and the other in Ballena's Lagoon, in 1859. In its habits, likewise, as observed on the coasts of California, Mexico and Peru, it shows a striking difference. They are often remarked upon by whalemen as a "mongrel breed," of doubtful character, often seen in company with Blackfish, sometimes with Porpoises, and occasionally with Humpbacks, when the latter are found in large numbers on an abundant feeding ground. They are met with likewise in the lagoons along the coast, sometimes singly, or in pairs or fives and sixes—rarely a larger number together—straggling about in a vagrant manner through the winding estuaries, subsisting on the fish that abound in them. At times they are seen moving lazily along under the shade of the mangroves that fringe the shores in many places, at other times lying about in listless attitudes among the plentiful supplies of food surrounding them, consisting of many varieties of the finny herds that swarm in those waters.

THE KILLER.

ORCA RECTIPINNA Cope.

The Killer is a peculiar species of Cetacean, that is found wherever the Balæna Whales resort, and about islands and rocks that are the breeding places of seals; consequently their feeding ground is as vast as that of the Humpback.

Their average length is about twenty feet for the males and fifteen for the females, a long dorsal fin distinguishing them from all others of the Dolphin tribe, as well as the shape of their head, which is more pointed than that of the Blackfish, and with a still shorter beak than in the common Porpoise. Their color is black or black with streaks of white on the forward part of the sides from near the eye, extending as far as the end of the back fin in some cases. A greater portion of the belly is almost invariably white in the females. We never have seen but one of the species dead (a female, fifteen feet long, which answers to the above description). The back fin, on account of its extraordinary length, gives the fish a very singular appearance when moving along in its usual manner. It measures six feet or more with the larger males, who may always be known by the extremity of the fin turning over on one side as represented in the accompanying illustration. This protuberance vibrating in the air as the animal rolls to and fro or makes its tumbles over the waves, appears as though it was a great burden and required much effort for the animal to keep right side up. But from what we have observed in different latitudes we are inclined to the opinion that there must be more than one species of Killer on the Pacific coast. Those about the shores of California to all appearance are rather slender animals, with a long dorsal fin of dagger shape projecting from the back about one-third of the distance between the extreme end of the head and the "flukes." The covering of fat on the one that was taken did not exceed three-fourths of an inch in average thickness, and was very white. The yield of oil was one and a half barrels, and nearly as clear as spring water.

Although diminutive in size compared with the different species of whales, they prey upon them all, except the Cachalot, the lips and tongues of the animals often affording them a bountiful repast. These Killers may be not inaptly styled the cannibals among the whale kind, being the only species that destroys individuals of their own race to afford them food. It is a most surprising sight to witness three or four Killers about a whale. The sight of them before making any attack seems to nearly paralyze the huge monster, who frequently remains nearly stationary, submitting to the attacks of its enemies on either hand, and making little if any resistance.

The mode of attack is to keep about the whale's head, seizing it by the lips, hauling it under water, and it is said to eat out the tongue. We once saw the attack made by three of these voracious animals on a "cow and calf," in a lagoon on the coast of Lower California. The whale was of the species known as the California Gray, and her young one was grown to three times the bulk of the largest Killer. The three made the attack, which lasted for an hour or more, alternately on the old whale and her offspring, finally killing the calf, which sunk to the bottom where there were about five fathoms depth. During the melee the mother became nearly exhausted, having received several wounds about the *lips*. As soon as the prey was on the bottom the Killers descended, bringing up large pieces of the flesh, and devoured it after coming to the surface. While gorging themselves in this manner the old whale made her escape. The scene took place within about two hundred yards of the vessel, our observations being made from the deck, and during the time the whales and killers kept nearly a stationary position. Instances have been known where Killers have attacked whales that had been killed by whalemen, and were being towed to the ship, in so determined a manner that, notwithstanding they were frequently lanced, or cut with a bow spade, they took the animal from its human captors and hauled it under water out of sight. But the Killer does not always live on whales. For several seasons we had noticed them about the seal islands along the coast, and came to the conclusion that they subsisted on the fish found around the edge of the kelp. By chance, however, we were so fortunate as to take one of them, as before mentioned, and on examining, to satisfy our curiosity about the character of its food, found that it consisted of young seals. At the time it was the sealing season, and the beaches about the island were covered with innumerable herds, and, although there were sealing parties about the shores from early dawn till dark, no one ever saw these savage animals molest the seals that were continually swimming about in large numbers.

Compared with other species of the Dolphin family, the Killers are not numerous. Their mating season, or time of gestation, is a matter of conjecture; probably in this respect they are similar to the Sperm Whale. We have met with them in mid winter about the Gulf of Georgia, and along the northern coast as far as Sitka, as often as at any other season of the year, showing plainly that they are not confined to warm latitudes, nor migrate from the colder climates during the rigorous months, and, in whatever region found, they seem to be always prowling for prey.

THE SHORT-FINNED KILLER.

Orca ater Cope.

The Killers I have noticed in the Gulf of Georgia, about the northern end of Vancouver Island, and as far north as the Aleutian Islands, appear to have more white on the sides and are of a dull black on the back, the dorsal fin shorter and much wider at the base. Their habits, however, are the same, being almost invariably seen going along, with an undulating movement, three, four, six, or eight together. They are generally irregular in their course, and are much more of the time below than upon the surface of the water.

November 7th, 1868, we saw, in the Strait of Juan de Fuca, off Port Angelos, a number of Killers moving rapidly up the strait. We noticed one of the number peculiarly marked on the side with a white spot of shape as shown in the sketch. They were marked on the back also, with a brown spot approaching a crescent shape, just behind the dorsal fin; but we did not see them long enough to ascertain the shape with any degree of accuracy. The pectorals of the Killers seem to be farther from the head in proportion to their length of body than any others of the Dolphin family. This seems to be a provision of nature to facilitate their attacks on the whales, as when inserting the head between the lips of the Balæna, to eat out its tongue, these side fins of the former are not in the way.

I am fully convinced that there are at least two species of Killers on the coast between the latitudes of 20° and 60° north: one with a dorsal fin excessively long, narrow at the base, standing very erect; the other species with a shorter fin, somewhat curved, much broader and slanting backward.

THE WHITEFISH.

Beluga sp.?

My opportunities for observing the habits of the Whitefish, as termed by the American whalemen, have been as follows: In the Okhotsk Sea, along the coast of Eastern Siberia, during the summer of 1862; in Plover Bay, lat. 64° 26′ N. long. 173° 07′ W., September, 1865, and in the same place and month of 1866; in Norton Sound Sept., 1865.

Their habits are similar to those of the Blackfish in many respects, being seen in schools of various but usually less numbers than the former. When pursued they appear to be wild and to avoid the boats. One striking peculiarity I observed was their going along *one after the other in a sort of train*, coming to the surface and spouting irregularly, showing but little of the body above water. It was unusual to see more than two or three abreast, undulating through the water, at the same time. They often make a noise when coming to the surface that may be compared to the faint low of an ox, but the strain not so prolonged. Sometimes they gambol about vessels as do porpoises. We know of only one instance, however, which was in Tchantar Bay, during calm weather, in August, 1862. All our efforts to capture one proved fruitless. We learned from the natives that they were less shy about the mouths of rivers, where they resort frequently during the warm season, and even ascend into fresh water where the depths permit. Only one chance of getting a view of the animal was in the water close alongside the ship, and it answered to the description of those found in the Arctic Ocean, the head and neck appearing much smaller in proportion than that of any other species of the Dolphin family. Their length may average ten feet, color white or yellowish white.

THE BLACKFISH.

GLOBIOCEPHALUS SCAMMONII Cope.

The Blackfish is found wherever sperm whales are, but in many instances they congregate in much larger numbers, and are nearer to the coast than the regular feeding grounds of the latter.

Although subsisting almost entirely on the same kind of food, the "squid," still, at times, when they visit bays or lagoons, they prey upon small fish found there. In Magdalena Bay we have seen them in small schools, appearing as much at home miles from sea as the Porpoise or Cowfish.

They are seen in schools of from ten or twenty to hundreds, going along with less of the rising and falling movement than the Porpoise, and usually spouting eight or ten times before "going down." If moving quickly much of the head and body is exposed. When seen by whalemen in this wise they call it going "eye out." In low latitudes, during perfectly calm weather, it is not unfrequent to find them lying quite still, huddled together promiscuously, making no spout, and seemingly taking a rest.

The 14th December, 1862, on the coast of Lower California, in lat. 31°, land ten miles off, a school of Blackfish were "raised." We lowered the boats and gave chase; three were taken. The largest was measured accurately, and the dimensions were as follows:

	Ft.	In.
Length	15	6
Depth of body	3	6
Circumference of body	8	9
Breadth of flukes	3	6
Depth of flukes	1	0
Distance from end of head to spoutholes	1	6
" " eye	1	4
" " dorsal fin	4	6
Length of pectorals	2	10
Distance from end of head to pectorals	2	9
Extreme width of pectorals	1	0
Length of mouth	1	4
" dorsal fin along the back	2	0
Extreme length of dorsal fin, upper edge	2	4
" width "	1	0
Distance from flukes to arms	5	0
" " abdomen	6	0
Length of spouthole across the head	0	4

The accompanying sketch exhibits the proportions of the animal. Its color is black. The profile of head shows its shape laterally, and the spouthole, which is of a half circular shape, opening like a valve when the spout ascends, closing as it escapes. The jet is not visible above two or three feet, and rises perpendicularly when not affected by the wind. The number of teeth on each side of the upper jaw varies from ten to twelve, in the lower jaw from eight to ten; the exposed parts one-fourth to three-fourths of an inch long.

The breadth of the head where cut from the body—just forward of the side fins—was twenty-two inches. From all we can learn of their breeding habits, they bring forth their young at any time, or in any part of the ocean, as necessity may require. Off the Gulf of Dulce, coast of Guatemala, in February, 1853, a calf taken from one was three feet long, the mother measuring thirteen feet. In the same school it was taken from we saw several young ones apparently about the same size as that above named, hence doubtless this fœtus, had it not been disturbed, would have soon played in its native element.

The Blackfish is taken for its oil, which is however much inferior to sperm, and the yield is small compared with its size, which may be calculated as varying from ten to twenty-five feet in length, and the production of oil from half a barrel to ten, the coating of fat or blubber varying in thickness from one to three inches, and nearly white.

The flesh is like coarse beef, and after being exposed to the air for a few days, then properly cooked, is by no means unsavory food, and is often used by whalemen as a substitute for the fresh meat of land animals. The same may be said of the different species of Porpoises.

Formerly Blackfish were found in large numbers on the coast of Lower California, particularly about Cape St. Lucas and up the Gulf, but, probably from the same cause as made mention concerning Sperm Whales, these grounds are now but little frequented by them.

The Pursuit and Killing.

Although the Blackfish is taken for its oil, it is not an object of pursuit by the whaler, as is the Balæna and Cachalot. Sperm whalers do not lower their boats for Blackfish when on Sperm Whale ground, unless the day is far spent or there is little prospect of "seeing whales."

The northern or polar whaleships pay but little attention to them, except it may be when passing the time "between seasons," cruising within or about the tropics. Occasionally a small vessel is fitted out for blackfishing and sperm whaling, carrying a proportionately limited crew, thereby making blackfishing profitable.

When a ship's boats are lowered for blackfish the chase begins as for other whales, although the masters of many ships have their boats all ready, and run just ahead of or into the school with the ship before lowering, by which means they are generally so much frightened or "gallied," that they "bring to," that is, stop for a short time, or move but slowly in all directions, giving the boats, which are instantly lowered, a good chance to "get fast." The harpoon frequently kills the fish; if not, a few darts with the hand lance dispatches it. As soon as dead they almost invariably sink; therefore, if the ship is close to, the fish is towed to the vessel at once; but if a considerable distance off it is either made fast to the loggerhead at the stern of the boat, or a buoy is tied to it and left, the boats continuing the chase. In this way quite a number are captured from one school.

Their favorite resorts along the coasts of North and South America, on the Pacific side, are off Guatemala, Equador and Peru.

VIII. *PHYSETERIDÆ.*

THE SPERM WHALE.

Physeter macrocephalus Linn.

The Sperm Whale in form and habits is in many respects the opposite of the Balæna. Its color is a dull black, and in some individuals, particularly the old males, approaches nearer to gray.

Its principal food is "squid," the flesh of which is tender, destitute of bones, and as white as that of the sun-fish. "The upper portion of the head embraces a large cavity, separated and covered by cartilages, and filled with an oil which becomes fixed as it cools, and is known under the name of spermaceti. The body yields sperm oil. The substance known under the name of ambergris is a concretion found in the intestines of Sperm Whales."

The Sperm Whale is found usually in the deep open sea, or, as whalemen term it, "off soundings," but many instances are known of their being seen in large numbers, and captures have been made on soundings. This has been the case to our knowledge off St. Bartolme Bay and Ballenas Bay, on the Lower California coast, the depth of water at these places varying from forty to eighty fathoms.

Many have the impression that the Sperm Whale is found but rarely out of the limits of tropical or temperate waters, but we have known of the larger class being often taken as far south as 50° of latitude, both in the Pacific and Atlantic, and as far north in the Pacific as Cape Ommany, which is in latitude 56° 12′.

The Sperm Whale is usually found in schools numbering from fifteen up to hundreds, females with their young predominating; sometimes the large males are found alone, at other times in schools, either alone or in company. The sperm whale is very regular in its spoutings, the volume of vapor being ejected forward in one column at nearly a right angle with the body, and the time it remains under water after it has made its habitual number of blows is marked with great uniformity also. The spout-hole is situated at a point formed by the superior and anterior surfaces of its head, a few inches on the left side.

The one referred to as being taken off the Galapagos Islands in 1853, spouted (or blowed) fifty-five times while on the surface (ten minutes), and when he descended to the depths below, turned his flukes a few feet out of water and was not visible again for fifty-five minutes; at the expiration of which time he was seen as before, and when his spoutings were out, which occurred at regular intervals, he again disappeared in the same manner. This whale was pursued from eleven o'clock A. M. to four P. M., during which time he did not deviate in his course, and the number of respirations at each rising and the time of remaining under water after turning flukes were alike.

The smaller and younger whales spout a less number of times, remain under water a shorter period, and are not quite so regular in their habits. This class of them usually remain above water one-fourth or one-fifth of the time, making from thirty to forty spouts at each rising, and remain under water about twenty minutes.

But when the Cachalot becomes alarmed, or is sporting on the ocean, it exhibits widely different actions, sometimes thrashing the water with its flukes (i. e. "loptailing,") at times descending below the surface, then giving itself a shoot out of the water at an angle of about forty-five degrees, falls on its side, raising the water into a pile of foam that may be seen from the masthead in clear weather fifteen miles. This singular antic is accounted for by its pursuers, that it is to rid itself of "suck fish" and "crab-lice," but after examining these marine vermin, the reason appears to be an improbable one. The Sperm Whale is seen not unfrequently in a perpendicular posture with the head above water; it has a habit likewise of rolling over many times in succession; this it does occasionally after being harpooned, winding the line around its body; when "gallied"* it frequently "sweeps" around to ascertain whether there is any object within reach; this "sweeping" is performed by moving its tail from side to side. When feeding it is said to move through the water with its under jaw hanging down perpendicular to its body, and when any substance comes in contact with it the jaw is instantly shut; but when on the surface, if the animal attacks a large object like a boat, it turns over on its back to bite.

Its time of gestation is not known, but is supposed to be ten months, and it brings forth its young in any part of the ocean it may be in, seldom having more than one at a time, never more than two.

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* Frightened.

Formerly this species was found in great numbers along the coast of Upper California. The ships cruising for them kept in a belt of water extending about one hundred miles from the land and closing in with the shore.

The frequent passing of steamers and the large increase in the number of sailing vessels on the coast seems to have driven them from these feeding grounds, and consequently at the present time this old cruising ground is nearly abandoned. In their capture the bomb-gun and lance is used by American whalers in addition to the ordinary hand harpoon and lance. Greene's gun is much used by English colonial whalers in addition to the old method.

IX. PINNEPEDIA.—THE SEA-ELEPHANT.

MACRORHINUS ANGUSTIROSTRIS, Gill.

Proceedings of the Essex Institute v, 1866.
Proceed. Chicago Ac. Nat. Sci. ? loc.

A species of seal was in former years found along the coast from Cape St. Lazarus to Point Reyes, herding on sandy or shingle beaches in great numbers, and were known as the sea elephant. This animal, in form, resembles the common seals, only materially differing in its mammoth proportions. Frequently those unacquainted have mistaken "rookeries" of sea-lions for elephants.

The extreme length of the oldest males will average fourteen or fifteen feet; the longest we have ever seen measured twenty-two feet from tip to tip, but frequently individuals have been met with that gave seventeen to eighteen feet from extreme end of trunk to that of posterior flippers. Its color is a light brown, when the hair is grown to full length; but immediately after "shedding" it becomes of a leaden color, similar to the land elephant. The hair on the body is very short and thin; about the under side of the neck in the oldest males, the animal appears to undergo a change with age, the hair falls off, the skin thickens and becomes wrinkled, the furrows crossing each other, producing a checkered surface, and sometimes the throat is more or less marked with white spots. Its proboscis extends from opposite the angle of the mouth forward (in the large males) about fifteen inches when the animal is in a state of quietude, and the upper surface appears ridgy; but when it makes an excited expiration the trunk becomes more elongated and the ridges nearly disappear. The average thickness of the skin that covers the body is fully equal to that of the largest bullock. The mouth is furnished with teeth similar to those of the Sea-Lion, the lower and largest canines being from four to five inches long, the exterior portion conical, and presenting a smooth surface, the part imbedded in the jaw slightly curved and ridgy; the whole tooth is nearly solid, a small cavity only appearing at the lower end. The females average ten feet between extremities and are destitute of the proboscis, the nose being like the seals, except that it projects considerably more over the mouth. The canine teeth are shorter, smoother below the sockets, larger at the base and hollow nearly to the upper point. The sailors on one voyage not having a supply of pipes, made them of cow-elephants teeth, and the quills or leg-bones of the pelican; the former furnishing the bowls and the latter the stems.

Our observations on the Sea-elephant show that they were found in much larger numbers from February to June than during the other months of the year: but more or less were on shore at all seasons upon their favorite beaches, which were about Santa Barbara, Cerros, Guadaloupe, St. Bonites, Natividad, St. Roque and Ascension islands, and a few of the most inaccessible points on the main land between Ascension and Cerros. The first seen of them would be coming up out of the water near the beach, then crawling up by degrees, frequently reclining as if to sleep, then again moving up or along the shore, appearing not content with their last resting place. In this manner they would ascend ravines or low intervals half a mile or more. They are not so active on shore as the seals, but when excited to inordinate exertion their motions are quick, the whole body quivers in their semi-vaulting, crawling gait, and the animal at such times manifests great fatigue ; notwithstanding its unwieldiness we have sometimes found them on broken and elevated ground fifty or sixty feet above the sea. The principal seasons of their coming to shore are when they are about to shed their coats, and the females to bring forth their young (which is one at a time, rarely two), and the mating season. These seasons for "hauling up," as it is termed, are more marked in southern latitudes, as I have learned from ship masters who have taken seals about Kerguelen's Land, the Crozets and Hurds Islands. The different periods were known as the pupping cow season, the brown cow, bulls and cows, and march bull seasons. But in the species of our coast, either from the influence of climate, or some other cause, we have noticed young pups with their mothers at quite the opposite months. The time of gestation is supposed to be three-fourths of the year. The continual hunting of these animals may have possibly driven them to irregularities. The most marked season, however, that we could discover was that of the matured males, which shed their coats later than the younger ones, and the females ; still among the largest herd of these gregarious creatures taken on Sta. Barbara Island, in June 1852, were several cows* with pups apparently but a few days old. When they come on shore for the purpose of "shedding," if not disturbed, they remain out of the water till the old hair falls off; by the time this change comes about, the animals are supposed to lose at least half their fat. In the stomach of the Sea-elephant a few pebbles are found, which has given rise to the saying that " they take in ballast before going down," (returning to the sea). On warm sunny days we have watched them come up singly on a smooth beach and burrow in the dry sand, throwing the loose particles that collected about the fore limbs over their backs, nearly covering themselves from view. The largest number we ever found in one herd was one hundred and sixty-five, which lay promiscuously along the beach or up the ravine near by. The mode adopted to capture them is to land in front of the "rookery," getting between them and the water, with clubs and lances in hand, then raising a loud noise and moving slowly toward them, they retreat back, appearing in a great state of alarm. Occasionally an overgrown male will give battle, or attempt to escape, but a ball from a musket through his brain despatches him, or some one with a lance checks his progress by thrusting it into the roof of his mouth, which causes the animal to throw back its head and settle on its haunches; meanwhile two men with heavy oaken clubs give it repeated blows about the head until it is stunned or killed. After dispatching those that are disposed to show resistance the party rush on to the main body, and the onslaught creates so complete a panic among these harmless creatures, that losing all control of their actions they will climb, tumble or roll over each other, when prevented from further retreat by the projecting cliffs. One instance occurred where a rookery of sixty-five were captured, and several were found that had neither been clubbed or lanced, but were smothered by numbers of their kind piled upon them. The whole flock when attacked manifest alarm by uttering their peculiar roar, the sound of which among the large males is nearly as loud as the lowing of an ox, but more prolonged in one strain, hoarser, and accompanied with much rattling in the throat.

The quantity of blood in this species is supposed to be double that contained in a neat animal in proportion to its bulk. After the capture the flaying begins. First, with a large knife the skin is ripped on the upper side of the body its whole length, then skinned down as far as practicable without rolling it over. The coating of fat that lays between the skin and the flesh, being from one to seven inches in thickness, according to the size and condition of the animal, is cut off into "horse pieces" about eight inches wide by twelve to fifteen long, and a puncture made in each piece large enough to pass a rope through. After *flensing* the upper side the animal is rolled over and cut all around as above described. Then the horse pieces are strung on a raft-rope,* which is taken to the edge of the surf and a long line made fast to it, the end being thrown to a boat that lies just outside of the rollers. They are thus hauled through the breakers and towed to the vessel, where they are tried out on board.

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* The term "cow and calf" are whalemen's names for mother and offspring of those animals. Sealers apply the term clapmatch to the female seals, and to the young, pup. Between whalers and sealers has originated cow for the female sea-elephant, while her offspring is called a "pup."

The oil produced is superior to whale oil for lubricating purposes. The individual yield may be less than a barrel with the smaller males and females, but the larger males make from three to seven. Owing to the continual pursuit of these animals they have become nearly, if not quite, extinct, or have fled to some isolated, unknown points for security. The latter conjecture, however, seems hardly probable, for the Sea-elephant, it is said, has never been found in the north Pacific, except on the coasts of the Californias.

Notice of some extinct VERTEBRATES from Wyoming and Dakota.

BY JOSEPH LEIDY, M. D.

1. OMOMYS CARTERI.

On several occasions, Mr. J. Van A. Carter, of Fort Bridger, Wyoming, sent to me a number of fossils consisting of small blackened fragments of bones, together with casts of fresh water shells, obtained from a tertiary formation. In one of his letters, Mr. Carter remarks that the country in his vicinity is covered with buttes, composed mostly of a gray sandstone, easily worn by the weather, wind and snow. Particular strata of a greenish gray cast contain the fossils.

Portions of rock accompanying the fossils consist of a crumbly, greenish gray, granular material, with few imbedded fragments of soft and more homogeneous rock. Some of the specimens contain multitudes of minute whitish concretions having a concentric arrangement. The fossil shell casts for the most part consist of what appear to be a species of Melania and of Planorbis. The bone fragments consist of remains of teliost fishes but mainly of reptiles, generally too imperfect for specific identification. The reptilian remains, mostly of turtles, indicate several species of Trionyx, Emys, etc.; a Crocodilian is also represented.

Among the fossil bones from the same formation, Mr. Carter sent me a portion of the cranium of a small mammal reduced to indeterminate fragments except a few pieces, which indicated apparently the skull of a carnivorous animal about the size and general form of that of the Mink. Fragments of the parietals and contiguous bones adherent to a portion of matrix, exhibit a long, low sagittal crest separating a capacious pair of temporal fossæ with surfaces almost as convex as in the Mink. A portion of the supra-occipital and condyles, adherent to another portion of matrix, enclose a foramen four lines in transverse diameter.

As Dr. Carter informed me that he had obtained the fossil cranium from its position in the rock, at my solicitation he examined the locality for other portions of the skull, and had the good luck to discover the greater part of the right ramus of the lower jaw, apparently of the same animal. This specimen indicates an insectivorous mammal, probably belonging to the family of the hedge-hogs. Among living insectivora, described and figured by DeBlainville,

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* A rope three fathoms long, with an eye spliced in one end.